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FLOOD PLAIN INFORMATION REPORT. OWASCO INLET AND HEMLOCK CREEK,--ETC(U)
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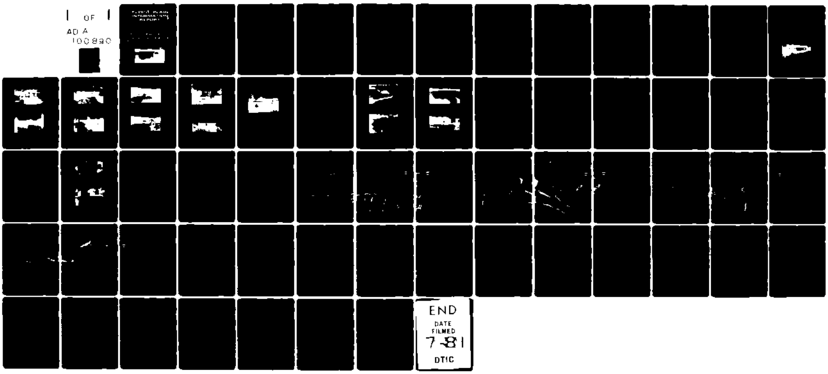

LEVEL III

FLOOD PLAIN INFORMATION REPORT

OWASCO INLET AND HEMLOCK CREEK

VILLAGES OF MORAVIA AND LOCKE CAYUGA COUNTY, NEW YORK

PREPARED THROUGH THE COORDINATION OF THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION BY THE DEPARTMENT OF THE ARMY, BUFFALO DISTRICT, CORPS OF ENGINEERS, BUFFALO, NEW YORK.

JULY 1976

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The portion of the Owasco Inlet Valley covered by this report is subject to flooding from both the Inlet and Hemlock Creek. This report has been prepared because a knowledge of flood potential and flood hazards is important in land use planning of flood plains. It includes a history of flooding in the lower Owasco Inlet alley and identifies those areas that are subject to possible future floods. Specail emphasis is given to these floods through maps, photographs, profiles and cross sections.

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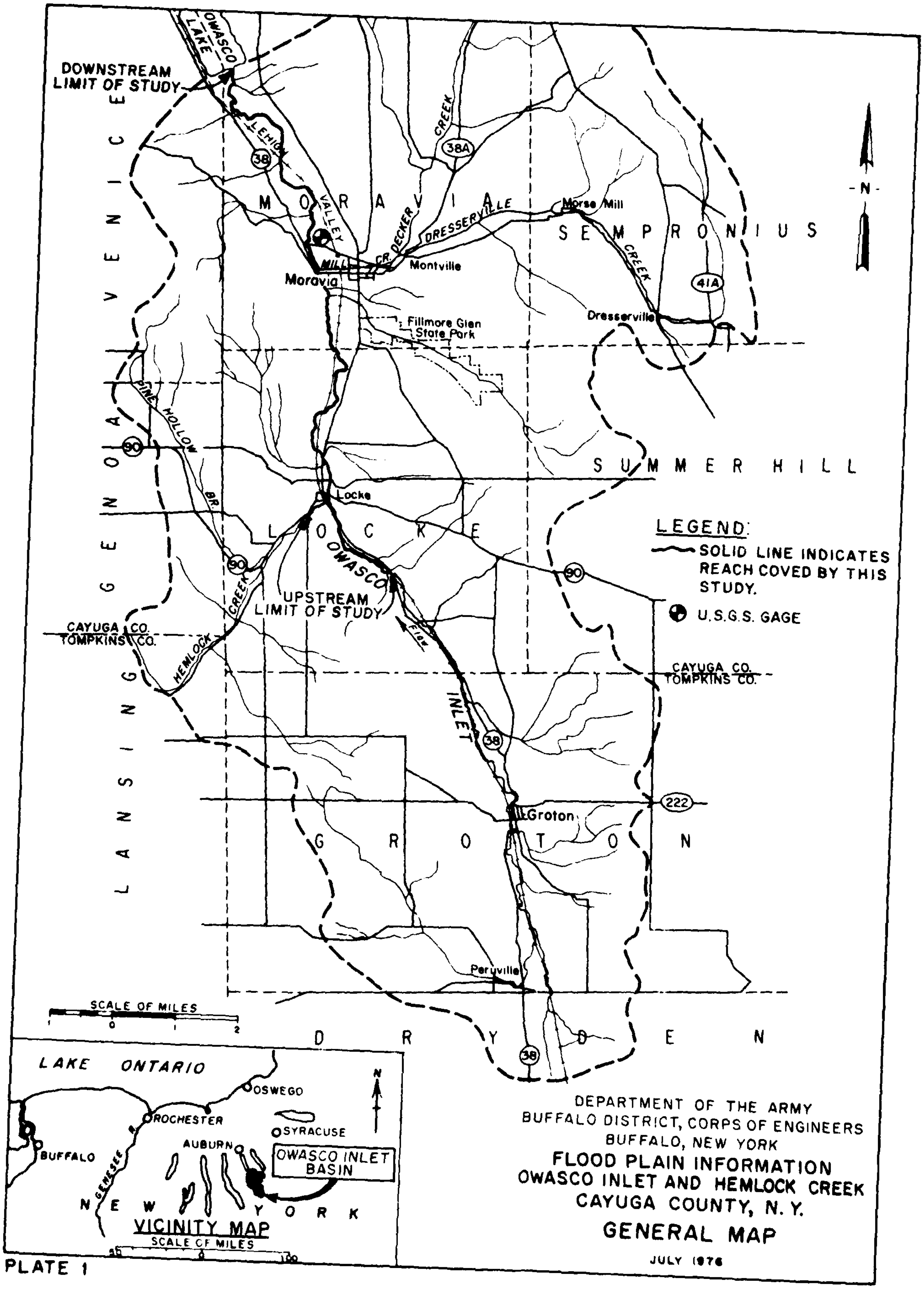
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DOWNSTREAM LIMIT OF STUDY
LEHIGH
VALLEY
CREEK
38
38A
M O R A V I A
DECKER CR.
MILL
DRESSERVILLE
Morse Mill
S E M P R O N I U S
CREEK
Moravia
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41A
Dresserville
Fillmore Glen State Park
V E N I C E
G E N O A
PINE HOLLOW BR.
90
S U M M E R H I L L
Locke
L O C K E
OWASCO
UPSTREAM LIMIT OF STUDY
FISH
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LEGEND:
SOLID LINE INDICATES REACH COVED BY THIS STUDY.
U.S.G.S. GAGE
INLET
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Groton
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N E W Y O R K
VICINITY MAP
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DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
BUFFALO, NEW YORK
FLOOD PLAIN INFORMATION
OWASCO INLET AND HEMLOCK CREEK
CAYUGA COUNTY, N. Y.
GENERAL MAP
JULY 1976

PLATE 1

PREFACE

The portion of the Owasco Inlet Valley covered by this report is subject to flooding from both the Inlet and Hemlock Creek. The properties along these streams are primarily residential and agricultural and have been severely damaged by the floods of 1905 and 1935. The open spaces in the flood plains which may come under pressure for future development are extensive. Although large floods have occurred in the past, studies indicated that even larger floods are possible.

This report has been prepared because a knowledge of flood potential and flood hazards is important in land use planning of flood plains. It includes a history of flooding in the Lower Owasco Inlet Valley and identifies those areas that are subject to possible future floods. Special emphasis is given to these floods through maps, photographs, profiles, and cross sections. The report does not provide solutions to flood problems; however, it does furnish a suitable basis for the adoption of land use controls to guide flood plain development and thereby prevent intensification of the loss problems. It will also aid in the development of other flood damage reduction techniques such as works to modify flooding and other adjustments, including flood proofing, which might be embodied in an overall Flood Plain Management (FPM) program. Other FPM program studies, those of environmental attributes and the current and future land use role of the flood plain as part of its surroundings, would also profit from this information.

This report was prepared at the request of the defunct Eastern Oswego Basin Regional Water Resources Planning and Development Board, with the endorsement of the New York State Department of Environmental Conservation, under continuing authority provided in Section 206 of the 1960 Flood Control Act (Public Law 86-645), as amended.

Assistance and cooperation of the Moravia Register, Sallee Barder, Paul Rowe, Bob Killam and other private citizens in supplying useful data and photographs for the preparation of this report are appreciated.

Additional copies of this report can be obtained from the New York State Department of Environmental Conservation. The Buffalo District, Corps of Engineers, upon request, will provide technical assistance to planning agencies in the interpretation and use of the data presented as well as planning guidance and further assistance, including the development of additional technical information.

BACKGROUND INFORMATION

Settlement - Transportation routes were the main determinants of development in the area. Roads followed the Indian trails, and towns sprang up around the crossroads. Early manufacturing was attracted to the valley slopes near the short steep tributaries of the lake, because of the utility of water power. Unfortunately, these factors encouraged development of the valley floor which is prone to flooding. Electric power and new modes of transport have changed the economics of manufacturing. Consequently, many of the towns which grew around the early focal points have lost the original rationale for their existence. Industrial expansion has taken place elsewhere, but not in the basin.

Many of the basin's small villages have been ignored and bypassed, as modes of transportation have shifted.

The Owasco Inlet and its valley - The Inlet is located in a valley at the southern end of Owasco Lake, one of New York's so called "Finger Lakes." The valley was sculptured by the glaciers. Debris deposited upon their retreat blocked the valley's northern end to form the lake.

Owasco Inlet rises in northeastern Tompkins County near the village of Freeville and flows generally northward a distance of 20 miles to the lake. On its route are located the villages of Groton, Locke and Moravia. The valley is well defined, especially at the lower end, and has steep walls rising as much as 700 feet in less than a half mile. The stream channel is well defined with flat overbank areas containing residential and agricultural developments.

Considerable natural spawning of brown trout and lake-run rainbow trout occurs in the main stream of the inlet and in the tributaries. These waters serve as nursery areas and the stream is essential to Owasco Lake's principal warm-water species. Smallmouth bass, northern pike and walleye all utilize the lower portion of the stream for spawning.

The area studied includes the flood plain of Owasco Inlet from its mouth at Owasco Lake (stream mile 0.0) south to the Route 38 bridge, approximately two miles southeast of Locke, NY at stream mile 10.65, and the flood plain of Hemlock Creek from its mouth at Owasco Inlet (stream mile 0.0) southwest to stream mile .94, just upstream of the Old Genoa Road bridge.

The villages of Moravia and Locke, Cayuga County, are located on Owasco Inlet within this area. The portion of Owasco Inlet included in this study is shown on the General Map, Plate 1. Drainage areas contributing to runoff at locations in the study areas are shown in Table 1.

Table 1 - Drainage Areas

Owasco Inlet	Stream Mile	Drainage areas sq. mi.
Mouth of Owasco Inlet, at Owasco Lake	0.0	115.0
Downstream of confluence with Mill Creek	4.45	103.3
Upstream of confluence with Mill Creek	4.46	73.1
Upstream of Route 90, Locke, NY	8.65	55.1
Upstream of confluence with Hemlock Creek	8.66	37.1
Upstream of Route 38 at study limit	10.65	31.8
Hemlock Creek at mouth	0.0	18.0

Owasco Inlet basin has a humid continental climate. The temperature ranges from the 70°F average of summer to the 25°F average in winter. About 50 days of rain is experienced yearly, mostly during the spring and late fall. Average annual precipitation is 35 inches. The average annual snowfall is about 69 inches.

Developments in the flood plain - The basin is primarily rural with population centered in the villages of Moravia and Locke. In 1970, the populations of the villages of Moravia and Locke were 2,668 and 1,152 respectively, slightly increased from their 1960 levels of 2,406 and 982. These populations have remained relatively stable during the past 60 years and one would expect the trend to continue.

Virtually the entire watershed consists of field crop farms, pastures and forest cover. The Inlet's wide flat flood plain, in contrast to the hilly nature of the remainder of the basin, is suited to agricultural and residential development.

The Owasco Lake basin has not attracted intense urban residential or commercial development such as took place to the north, in Auburn. There is no extensive service area in the basin, and many of the basin's residents look to Auburn, Ithaca, or Cortland to fulfill

their requirements for basic goods and services. Commercial developments in the Owasco Lake basin are farm machinery, gasoline and automobile sales, feed and farm supplies, lumber, hardware, banking, real estate, grocery, and dry goods. These activities are located mainly in the villages of Moravia and Groton, making the Owasco Inlet Valley the main focus of commercial development in the basin. There are few industries in the Owasco Inlet Basin, the largest of which employs less than forty people.

SOURCES OF DATA

There has been one USGS stream gaging station (removed in 1963) within the basin, "Owasco Inlet at Moravia," with stream flow data for seven years of record. The location is shown on Plate 1. This stream flow data and data for basins with similar characteristics in and around the Oswego River Basin were used to determine the 10-year, 50-year, 100-year and 500-year flood flows.

A field survey for this report was undertaken in the summer of 1975. Nineteen (19) cross sections of the Inlet and Hemlock Creek were surveyed at key locations. In addition, at each of the seventeen (17) bridges which cross the Inlet and Hemlock Creek measurements were taken to determine the size of the bridge opening, and the roadway profile on each side of the bridge. Cross sections were also taken a short distance downstream and upstream of each bridge. In total, sixty seven (67) cross sections were surveyed. The Field Survey data are available in the Buffalo District, Corps of Engineers. Table 3 lists permanent elevation bench and reference marks used in the study.

FLOOD SITUATION

Flood season and flood characteristics - Major floods can occur on Owasco Inlet during any season of the year. Excessive runoff in the Owasco Inlet watershed results from one of the following conditions: (1) a collision, over the watershed, of a large mass of warm moisture-laden air from the South Atlantic or Gulf Regions with a mass of air of low temperature from the north, these are also known as "fronts," (2) spring floods which are normally the result of sharp rises in temperature which melt the snow cover of the basin, being frequently accompanied by rains, and (3) localized thunderstorms.

Factors affecting flooding and its impact

Obstructions to floodflows - Natural obstructions to floodflows include trees, brush and other vegetation growing along the stream banks in floodway areas. Man-made encroachments on or over the streams such as dams, bridges and culverts can also create more extensive flooding than would otherwise occur.

During floods, trees, brush and other vegetation growing in floodways impede floodflows, thus creating backwater and increased flood heights. Trees and other debris may be washed away and carried downstream to collect on bridges and other obstructions to flow. As floodflow increases, masses of debris break loose and a wall of water and debris surges downstream until another obstruction is encountered. Debris may collect against a bridge until the load exceeds its structural capacity and the bridge is destroyed. The limited capacity of obstructive bridges or culverts, debris plugs at the culvert mouth or a combination of these factors retard floodflows and result in flooding upstream, erosion around the culvert entrance and bridge approach embankments and possible damage to the overlying roadbed.

In general, obstructions restrict floodflows and result in overbank flows and unpredictable areas of flooding, destruction of or damage to bridges and culverts, and an increased velocity of flow immediately downstream. It is impossible to predict the degree or location of the accumulation of debris; therefore, for the purposes of this report, it was necessary to assume that there would be no accumulation of debris to clog any of the bridge or culvert openings in the development of the flood profiles.

Most of the 17 bridges which cross the inlet within the study area obstruct flood flows to some degree. The Lehigh Valley Railroad (LVRR) bridge, Figure 1, at mile 6.0 constricts high flows and diverts a portion of them to the east side of the LVRR tracks running north and south on the flood plain at that point. The LVRR bridge at mile 9.3, Figure 2, is built on timber piles which collect debris as is evident in the photo. Only its rather large size prevents it from being a major flow obstruction. Both the LVRR bridge at mile 8.8 on Hemlock Creek, Figure 3, and the Route 38 bridge 30' downstream are built on timber piles. The Route 38 bridge is an obstruction to high flows.

Table 4 lists relevant data on each of the bridges which cross the Inlet and Hemlock Creek within the study area. Figures 1 through 10 depict several other bridges which cross the Inlet.

Flood damage reduction measures - The Owasco Inlet from the mouth to upstream of Moravia was cleared and snagged by the Corps of Engineers in 1947. Sand bars, trees and other debris were removed in an effort to increase the flow carrying capacity. Channel improvement projects on Mill Creek and Dry Creek and levees on Dry Creek, constructed by the Corps of Engineers, have reduced the flood potential in Moravia due to these sources. There are no flood plain regulations in effect in the study area.

Other factors and their impacts - At present there is no flood warning or forecasting network within the Owasco Inlet basin. However, the Surveillance Radar operated continuously by the National Weather Service at the Rochester-Monroe County Airport can provide for early detection of a storm and information concerning the predicted path and amount of rainfall can be broadcasted by radio and television to affected areas. Appropriate action can then be taken to minimize flood losses.

There are no formal flood fighting or emergency evacuation plans for this area. The Volunteer Fire Departments of the villages of Moravia and Locke have in the past conducted resuce operations when required and pumped out flooded basements when necessary.

The trees which line the banks of the Inlet for most of its length are a potential source of debris which could clog bridge openings during a flood. Figure 2 shows present debris conditions at the Lehigh Valley Railroad bridge at mile 9.3.

Figure 1 - Upstream face of the Lehigh Valley Railroad Bridge at Stream Mile 6.0.

Figure 2 - Upstream face of the Lehigh Valley Railroad Bridge at Stream Mile 9.31. Note debris at face of bridge. Route 38 bridge in background.

Figure 3 - Upstream face of the Lehigh Valley Railroad Bridge at Stream Mile 0.14 on the Hemlock Creek. Route 38 bridge is 30 feet downstream and considerably smaller.

Photos taken April 1976

Figure 4 - Upstream face of the Route 90 bridge at Stream Mile 8.65.

Figure 5 - Upstream face of the Lehigh Valley Railroad Bridge at Stream mile 7.10.

Photos taken April 1976

Figure 6 - Upstream face of the Lehigh Valley Railroad
Bridge at Stream Mile 7.88.

Figure 7 - Upstream face of the new Route 38 bridge at
Stream Mile 7.98.

Photos taken April 1976

Figure 8 - Upstream face of the Erron Hill Road bridge, Stream Mile 8.4.

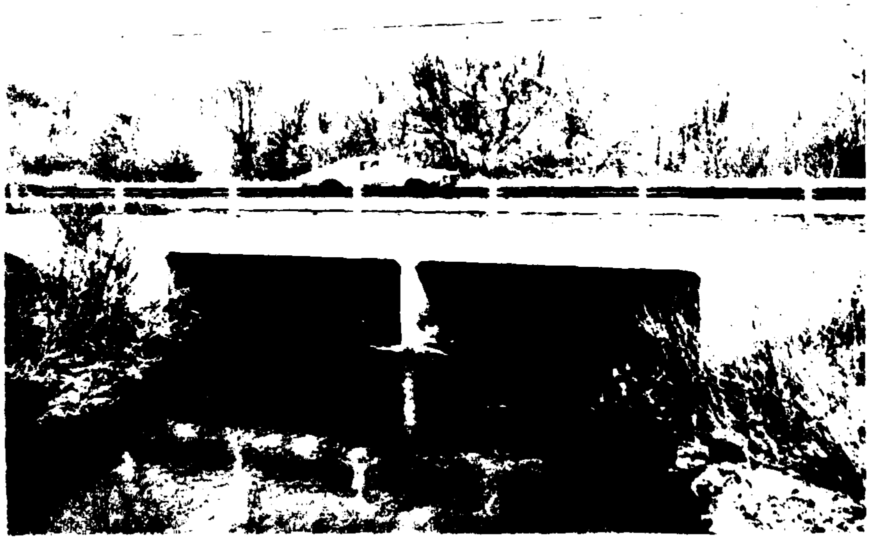


Figure 9 - Upstream face of the Route 38 bridge at Mile 9.29.

Photos taken April 1976

Figure 10 - Upstream face of the Cat Path Road bridge at Stream Mile 9.45.

Photo taken April 1976

PAST FLOODS

Summary of historical floods - Flooding of the Owasco Inlet Watershed occurs annually during the spring break-up, and frequently as a result of precipitation, during other periods. Floods of larger than average annual magnitude occurred in 1905, 1935, 1972 and 1975.

Flood descriptions

June 1905 - The precipitation causing the flood of 21 June 1905 was not exceptionally high. On 17-18 June, a general rainfall, having an average of 2.32 inches, occurred on and adjacent to the Owasco Inlet Watershed. Streams in these watersheds were swollen, but no flooding was reported. On 21 June, a storm of the cloudburst type affected a portion of the watershed of the Inlet, centering near the headwaters of Mill Creek, causing a severe flood at Moravia. Auburn, the only precipitation station on the watershed, recorded only 0.70 inches rainfall on 21 June. During the flood of 1905, the Moravia business district was flooded to a depth of about two feet. Depths in residential sections reached as high as three feet.

July 1935 - This storm, centered over south-central New York, consisted of a series of thunder showers occurring during the period 6-9 July. The heaviest precipitation occurred in an area from Keuka Lake to central Chenango County, in extent approximately 100 miles from west to east, and 15-20 miles from north to south. The southern portion of the Owasco Inlet Watershed extends into that area, wherein rainfall for 7-8 July exceeded nine inches. In Moravia, flood depths of one foot and two feet occurred in the business and residential sections, respectively. Figures 11 and 12 depict flooding conditions at Locke, NY during the flood.

June 1972 - The most destructive, widespread flooding of record over the eastern United States was caused by tropical storm "Agnes." During the period 21-23 June more than five inches of rain fell at Locke. Cayuga County was declared a disaster area.

September 1975 - During the period 24-27 September, Hurricane "Eloise" dropped 5.0 inches of rain at Locke. Flooding near Moravia destroyed field crops and damaged roads. Streets and the Moravia Elementary School were flooded. The village of Moravia Water Pollution Control Plant was inaccessible. Cayuga County was declared a disaster area.

Figures 13 and 14 depict flooding conditions at Moravia during the storm.

Figure 11 - Storm of 1935 floodwaters flowing over Route 38 at site of old bridge, 1/2 mile north of Locke, NY at Stream Mile 7.95.

Figure 12 - Storm of 1935 flood conditions at Route 90, Locke, NY. Just downstream of confluence with Hemlock Creek, Stream Mile 8.65.

Photos taken July 1935 and Provided by Bob Fillar

Figure 13 - Flooding conditions on Long Hill Road looking east towards Moravia, NY during September 1975 high water. Stream Mile 4.5.

Figure 14 - Flooding conditions at village of Moravia Water Pollution Control Plant, on Long Hill Road during September 1975 high water. Stream Mile 4.5.

Photos taken September 1975 by Sallee Barder

FUTURE FLOODS

Floods of the same or larger magnitude as those that have occurred in the past could and in all probability will occur in the future. Larger floods have been experienced in the past on streams with characteristics similar to those found in the study area. The combinations of rainfall and runoff which caused these floods could occur in the study area.

Flood magnitudes and their frequencies - There are no active gaging stations on Owasco Inlet, consequently, a statistical approach to determining flood discharges was not feasible. Nearby streams having the same basic characteristics as Owasco Inlet were used in a regional frequency analysis. This analysis resulted in a mean annual discharge versus drainage area relationship, which was developed into discharge-frequency curves.

Floods are classified on the basis of their frequency or return period. A 100-year flood is an event whose magnitude can be expected to be equaled or exceeded on the average of once every hundred years. The 100-year event has a 1 percent chance of occurrence in any given year. It is important to note that, while on a long-term basis the occurrence averages out to once per hundred years, floods of this magnitude can occur in any given year or even in consecutive years and within any given time interval. The 100-year flood has also been known as the "Intermediate Regional Flood" (IRF).

Similarly, the 10-, 50- and 500-year flood events are those floods whose magnitudes can, on the long term, be expected to occur on the average of once in every 10, 50 or 500 years.

It should be noted that there is a greater than 50 percent probability that a 100-year flood event will occur during a 70-year lifetime. Additionally, a house which is built at the 100-year flood level has a one in four chance of being flooded in a 30-year mortgage life.

Floods larger than the 500-year flood are possible. However, the probability of the necessary coincident climatic conditions arising is remote. Although it would be catastrophic if such floods occurred in a developed stream valley, their size and rarity are such that protection against them by protective works can seldom be economically provided.

Table 2 lists the estimated peak discharges for floods of 10-, 50-, 100- and 500-year return periods.

Hazards of large floods

The extent of damage caused by any flood depends on the topography of the area flooded, depth and duration of flooding, velocity of flow, rate of rise in water surface elevation and developments in the flood plain. Deep flood water flowing at high velocity and carrying floating debris would create conditions hazardous to persons and vehicles attempting to cross flooded areas. In general, flood water three or more feet deep and flowing at a velocity of three or more feet per second, could easily sweep an adult person off his feet, thus creating definite danger of injury or drowning. Rapidly rising and swiftly flowing flood water may trap persons in homes that are ultimately destroyed, or in vehicles that are ultimately submerged or floated. Water lines can be ruptured by deposits of debris and the force of flood waters, thus creating the possibility of contaminated domestic water supplies. Damaged sanitary sewer lines and sewage treatment plants could result in the pollution of flood waters creating health hazards. Isolation of areas by flood water could create hazards in terms of medical, fire or law enforcement emergencies.

Flooded areas and flood damages - The Index Map, Plate 2, locates the flooded area maps, Plates 3 through 6. The areas that would be flooded by the 100 and 500-year floods are shown in detail on Plates 3 through 6. The actual limits of these overflow areas may vary somewhat from those shown on the maps because the 20-foot contour interval and scale of the maps do not permit precise plotting of the flooded area boundaries.

Plates 7 through 9 show water surface profiles for the 10-, 50-, 100- and 500-year floods. Depth of flow in the channel can be estimated from these illustrations. Typical cross sections of the flood plain at selected locations, together with the water surface elevation and lateral extent of each of the floods, are shown on Plates 10 through 12.

Table 3 is a list of elevation reference marks. The list is furnished as an aid to local interests in setting minimum elevations for future development of establishing other elevations necessary to flood plain planning.

Obstructions - During floods, debris collecting on bridges could decrease their flow-carrying capacity and cause greater water depths (backwater effect) upstream of these structures. Since the occurrence and amount of debris are indeterminate factors, only the physical characteristics of the structures were considered in preparing the water surface profiles of the various floods. No reduction in carrying capacity from clogging or jamming was considered. Similarly, the maps of flooded areas show the backwater effect of obstructive bridges, but do not reflect increased water surface elevations that could be caused by debris collecting against the structures.

Table 4 summarizes pertinent bridge data and lists water surface elevations for the 100-year and 500-year floods at bridges that cross the Owasco Inlet.

Table 2 - Peak Flows for Various Floods

Location	Stream Mile	Drainage Area Sq. Mi.	10-Year Flood Discharge (cfs)	50-Year Flood Discharge (cfs)	100-Year (IRF) Flood Discharge (cfs)	500-Year Flood Discharge (cfs)
Mouth of Owasco Inlet (at Owasco Lake) to downstream of former (removed) LVRR bridge at mile 2.05	0.0	115.0	6,910	10,300	12,000	16,700
Downstream of former (removed) LVRR bridge to upstream of confluence with Mill Creek	2.05	107.0	6,300	9,450	11,000	15,100
Upstream of confluence with Mill Creek to upstream of LVRR bridge at mile 6.0	4.46	73.1	4,800	7,400	8,700	12,200
Upstream of LVRR bridge at mile 6.0 to 800' upstream of Rt. 38 bridge north of Locke	6.00	63.0	4,200	6,500	7,600	10,800
800' upstream of Rt. 38 bridge north of Locke to upstream of confluence with Hemlock Creek	8.15	58.2	3,720	5,820	6,850	9,800
Upstream of confluence with Hemlock Creek to study limit at Rt. 38 bridge 2 miles southeast of Locke	8.66	37.1	2,650	4,170	4,950	7,200
Hemlock Creek from confluence with Owasco Inlet to study limit upstream of Old Genoa Rd. bridge	0.0	18.0	1,400	2,240	2,670	3,850

Of the 17 bridges listed in Table 4 crossing Owasco Inlet most of them are obstructive to the 100-year flood and even more are obstructive to the 500-year flood. Some bridges may be high enough so as not to be inundated by flood flows; however, the approaches to these bridges may be at lower elevations and subject to flooding and rendered impassable.

Table 3 - Elevation Reference Marks for Owasco Inlet
In Cayuga County

Bench Mark(1) Designation & Approximate Stream Mile	Elevation(2) in Feet on U.S.C.&.G.S. Datum	Description
OWASCO INLET: Former (removed) LVRR Bridge at stream mile 2.07	717.31	Chiseled and painted cross in top of concrete remains of South Pier
USGS Bench Mark G-164 at stream mile 4.0	733.11	Bronze Disk in southwest abutment of Route 38 bridge approximately 1 mile west of Moravia
USGS Bench Mark F-164 at stream mile 4.5	744.56	Bronze Disk in west face of U. S. Post Office at Moravia. 0.6 feet south of the northwest corner
Long Hill Road bridge at stream mile 4.5	737.79	Chiseled and painted square in southeast corner of south-east concrete abutment
USGS Bench Mark E-164 at stream mile 5.7	757.64	Bronze Disk at Route 38 and Tollgate Hill Road, on east headwall of 72" oblate pipe
LVRR bridge at stream mile 7.1	765.32	Chiseled and painted cross in east side of top of north concrete abutment
Intersection Route 38 and Erron Hill Road at stream mile 8.35	794.36	Chiseled cross in top of fire hydrant at northeast corner
Intersection Routes 38 & 90 at stream mile 8.6	798.33	Chiseled cross in east bolt on rim near top of hydrant on southwest corner

Table 3 (Cont'd)

Bench Mark(1) Designation & Approximate Stream Mile	Elevation(2) in Feet on U.S.C.&.G.S. Datum	Description
Route 38 bridge at stream mile 9.3	803.53	PK and Shiner in top of northernmost post of guard rail above downstream face
HEMLOCK CREEK:		
Route 90 and Bird Cemetery Road at stream mile 0.50	819.71	PK and Shiner in top of wood post at northeast corner

(1) Bench Marks - A point of known elevation, usually a mark cut into some durable material such as stone or concrete, to serve as a reference point in running a line of levels for the determination of elevations. The list is furnished as an aid to local interests in setting minimum elevations for future development or establishing other elevations necessary to flood plain planning.

(2) Elevations established by Corps of Engineers during field surveys in July-September 1975.

Velocities of flow - Water velocities during floods depend largely on the size and shape of the cross sections, the conditions of the stream, and the bed slope, all of which vary on different streams and at different locations on the same stream. Table 5 shows channel and overbank velocities at selected locations for the 100 and 500-year floods. During a 100-year flood, velocities of main channel flow in the Owasco Inlet in the study area would range from 1.1 to 11.0 feet per second. Water flowing at this rate is capable of causing severe erosion to stream banks and embankments at bridge abutments and transporting large objects. Overbank flow in the study area would average 0.2 to 4.8 feet per second. Water flowing at two feet per second or less would deposit debris and silt.

Table 4 - Bridges Across Owasco Inlet & Hemlock Creek

Bridge	Mileage Above Mouth	Approximate Stream Bed Elevation	Approximate Low Steel Elevation	Approximate Bridge Floor Elevation(a)	Water Surface Elevation 100-year Flood(b)	Water Surface Elevation 500-year Flood(b)
OWASCO INLET						
Route 38	3.95	713.6	728.8	731.6	727.0	728.2
Long Hill Rd	4.50	717.0	731.4	736.6	730.2	731.1
Lehigh Valley Railroad	6.0	732.4	742.8	746.0	745.3	745.9
Lehigh Valley Railroad	7.10	752.2	762.3	772.0	765.2	768.1
Lehigh Valley Railroad	7.88	767.6	781.6	784.7	777.3	779.3
Route 38	7.98	767.2	778.2	780.4	780.3	782.6
Erron Hill Rd	8.40	774.4	788.6	790.8	790.4	791.1
Route 90	8.65	781.1	792.2	796.0	795.3	796.1
Route 38	9.29	789.5	798.5	802.4	802.0	804.2
Lehigh Valley Railroad	9.31	787.6	801.6	804.7	803.0	805.4
Cat Path Rd	9.45	791.5	801.8	804.5	804.9	806.1
Lehigh Valley Railroad	10.64	827.4	837.7	841.5	835.1	836.1
Route 38	10.65	827.2	838.4	842.1	836.4	838.8
HEMLOCK CREEK						
Route 38	0.12	786.5	795.3	797.5	798.0	801.8
Lehigh Valley Railroad	0.14	788.6	796.0	799.4	798.8	802.0
Bird Cemetery Road	0.50	809.2	818.1	819.7	816.8	818.7
Old Genoa Rd	0.82	831.8	841.7	844.0	840.4	842.8

All elevations given are on United States Coast and Geodetic Survey Datum

(a) Railroad Bridge floor elevations are top of rail

(b) Water surface elevations refer to upstream side of respective bridge

Table 5 - 100- and 500-Year Flood Discharges and Average Velocities

Stream Mile	Discharge (cfs)		Average Velocity (feet per second) Channel		Overbank	
	100 Yr.	500 Yr	100 Yr	500 Yr	100 Yr	500 Yr
Owasco Inlet						
0.00	12,000	16,700	1.1	1.1	.2	.2
2.05	11,000	15,100	5.9	8.0	1.5	2.2
4.46	8,700	12,200	3.4	4.3	1.0	1.5
6.10	7,600	10,800	3.5	4.3	2.0	2.2
8.15	6,850	9,800	3.6	3.7	1.9	2.0
8.66	4,950	7,200	4.4	5.3	2.0	2.5
Hemlock Creek						
0.00	2,670	3,850	1.4	1.7	1.0	1.2
0.94	2,670	3,850	7.2	8.1	3.5	4.0

Rates of rise and duration of flooding - Rates of rise are dependent upon the shape of the basin, antecedent conditions, intensity of the storm, development within the basin, and debris in the channel at the time of the storm.

The duration of a flood is dependent upon the duration of the storm, the storage capacity of the overbank, prolonged runoff from snowmelt, and high stages caused by ice jams, etc.

It is difficult to predict accurate rates of rise and duration because many variations in rainfall distribution could produce the 100- or 500-year peak discharge with a variety of rise rates.

A study of the nature of flooding within the study area indicates that the Owasco Inlet through the study area is prone to rapid and dangerous rates of rise. The rate of rise for flood conditions was estimated between 1.0 and 2.0 feet per hour, and flood conditions were estimated to last from one to two days.

Photographs, future flood heights - The expected levels of the 100- and 500-year floods for locations in the study area are indicated on Figures 15 and 16.

Figure 15 - Future flood heights at village of Moravia Water Pollution Control Plant, Stream Mile 4.5.

Figure 16 - Future flood heights on Route 38 at Maple Avenue, Locke, NY near Stream Mile 8.65.

Photos taken April 1976

GLOSSARY

Backwater - The resulting high water surface in a given stream due to a downstream obstruction or high stages in an intersecting stream.

Flood - An overflow of lands not normally covered by water and that are used or usable by man. Floods have two essential characteristics: The inundation of land is temporary; and the land is adjacent to and inundated by overflow from a river, stream, ocean, lake, or other body of standing water.

Normally a "flood" is considered as any temporary rise in streamflow or stage, but not the ponding of surface water, that results in significant adverse effects in the vicinity. Adverse effects may include damages from overflow of land areas, temporary backwater effects in sewers and local drainage channels, creation of unsanitary conditions or other unfavorable situations by deposition of materials in stream channels during flood recessions, rise of ground water coincident with increased streamflow, and other problems.

Flood Crest - The maximum stage or elevation reached by waters of a flood at a given location.

Flood Plain - The areas adjoining a river, stream, watercourse, ocean, lake or other body of standing water that have been or may be covered by floodwater.

Flood Profile - A graph showing the relationship of water surface elevation to location, the latter generally expressed as distance above mouth for a stream of water flowing in an open channel. It is generally drawn to show surface elevation for the crest of a specific flood but may be prepared for conditions at a given time or stage.

Flood Stage - The stage or elevation at which overflow of the natural banks of a stream or body of water begins in the reach or area in which the elevation is measured.

Floodway - The channel of a watercourse and that portion of the adjoining flood plain required to provide for the passage of the Intermediate Regional Flood.

Hurricane - An intense cyclonic windstorm of tropical origin in which winds tend to spiral inward in a counterclockwise direction toward a core of low pressure, with maximum surface wind velocities that equal or exceed 75 miles per hour (65 knots) for several minutes or longer at some points. Tropical storm is the term applied if maximum winds are less than 75 miles per hour.

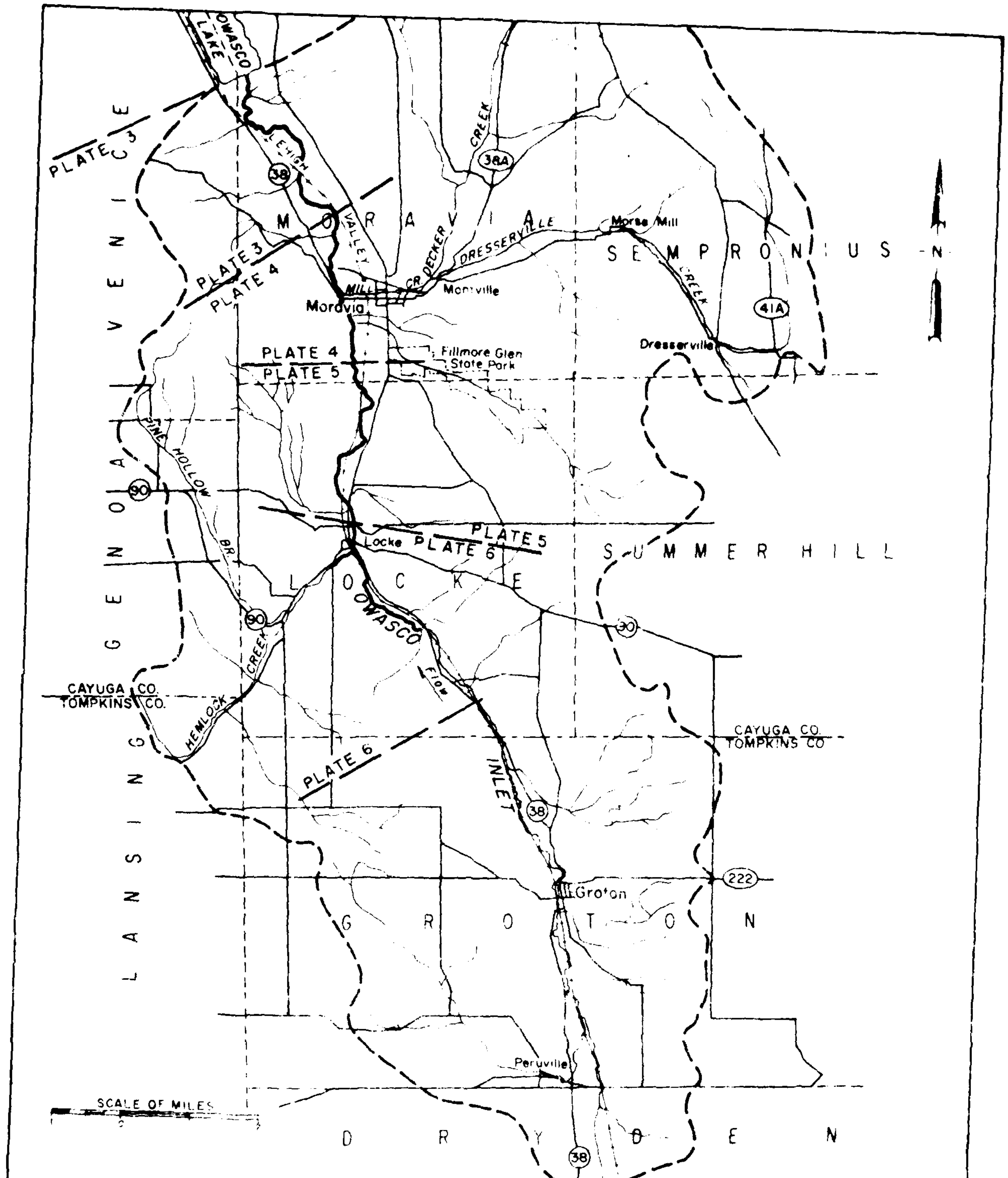
Hydrograph - A graph showing flow values against time at a given point usually measured in cubic feet per second. The area under the curve indicates total volume of flow.

Hydrology - The science that deals with the occurrence and behavior of water in the atmosphere, on the ground, and underground.

Intermediate Regional Flood - A flood having an average frequency of occurrence in the order of once in 100 years although the flood may occur in any year. It is based on statistical analysis of streamflow records available for the watershed and analysis of rainfall and runoff characteristics in the general region of the watershed.

Left Bank - The bank on the left side of a river, stream, or watercourse, looking downstream.

Right Bank - The bank on the right side of a river, stream, or watercourse, looking downstream.



LEGEND:

SOLID LINE INDICATES REACH COVERED BY THIS STUDY

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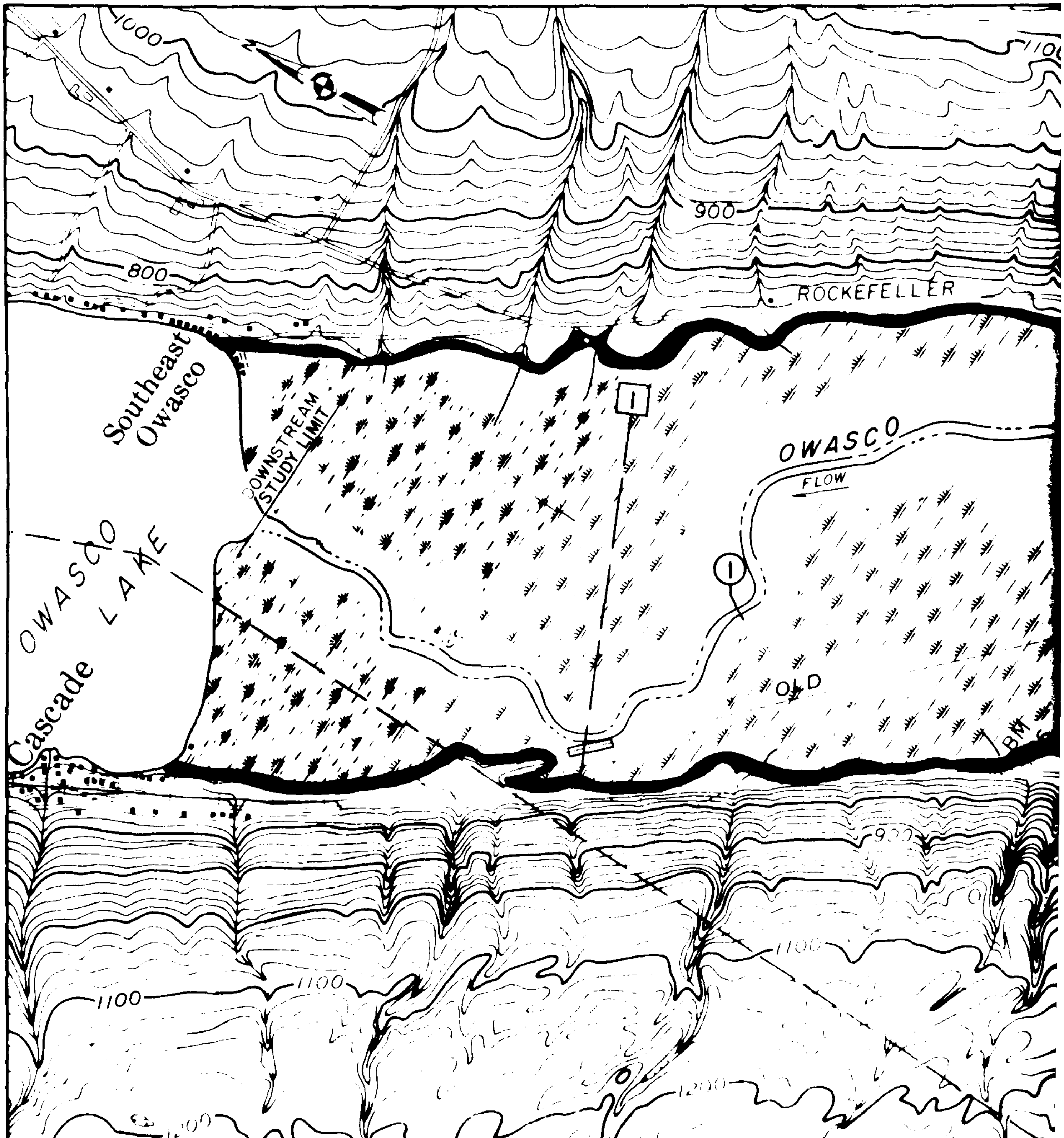
BUFFALO, NEW YORK

FLOOD PLAIN INFORMATION
OWASCO INLET AND HEMLOCK CREEK
CAYUGA COUNTY, N.Y.

INDEX MAP - FLOODED AREAS

JULY 1976

PLATE 2



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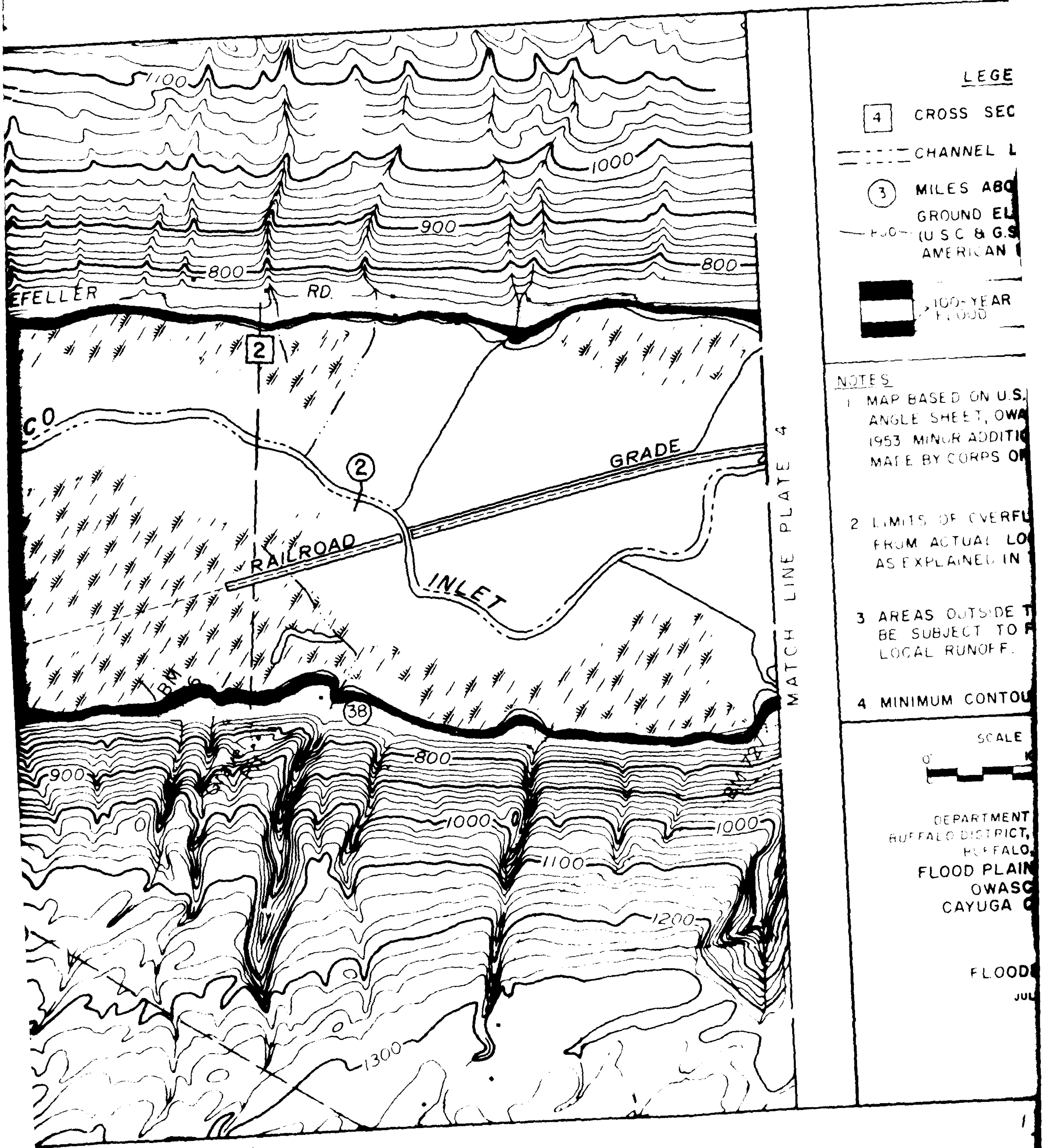

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4 CROSS SECTION

CHANNEL LIMITS

3 MILES ABOVE MOUTH

800 GROUND ELEVATION IN FEET (U.S.C. & G.S. 1927 NORTH AMERICAN DATUM)

100-YEAR FLOOD

500-YEAR FLOOD

NOTES

1. MAP BASED ON U.S.G.S. 7.5 MIN. QUADRANGLE SHEET, OWASCO 1955 & MORAVIA 1953. MINOR ADDITIONS AND ADJUSTMENTS MADE BY CORPS OF ENGINEERS.

2. LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT.

3. AREAS OUTSIDE THE FLOOD PLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF.

4. MINIMUM CONTOUR INTERVAL IS 20 FT.

SCALE IN FEET

0' 1000' 2000'

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CAYUGA COUNTY, N. Y.

FLOODED AREAS

JULY 1976

MATCH LINE PLATE 3
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ROCKEFELLER ROAD
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LONG HILL ROAD
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Sewage Disposal
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1200
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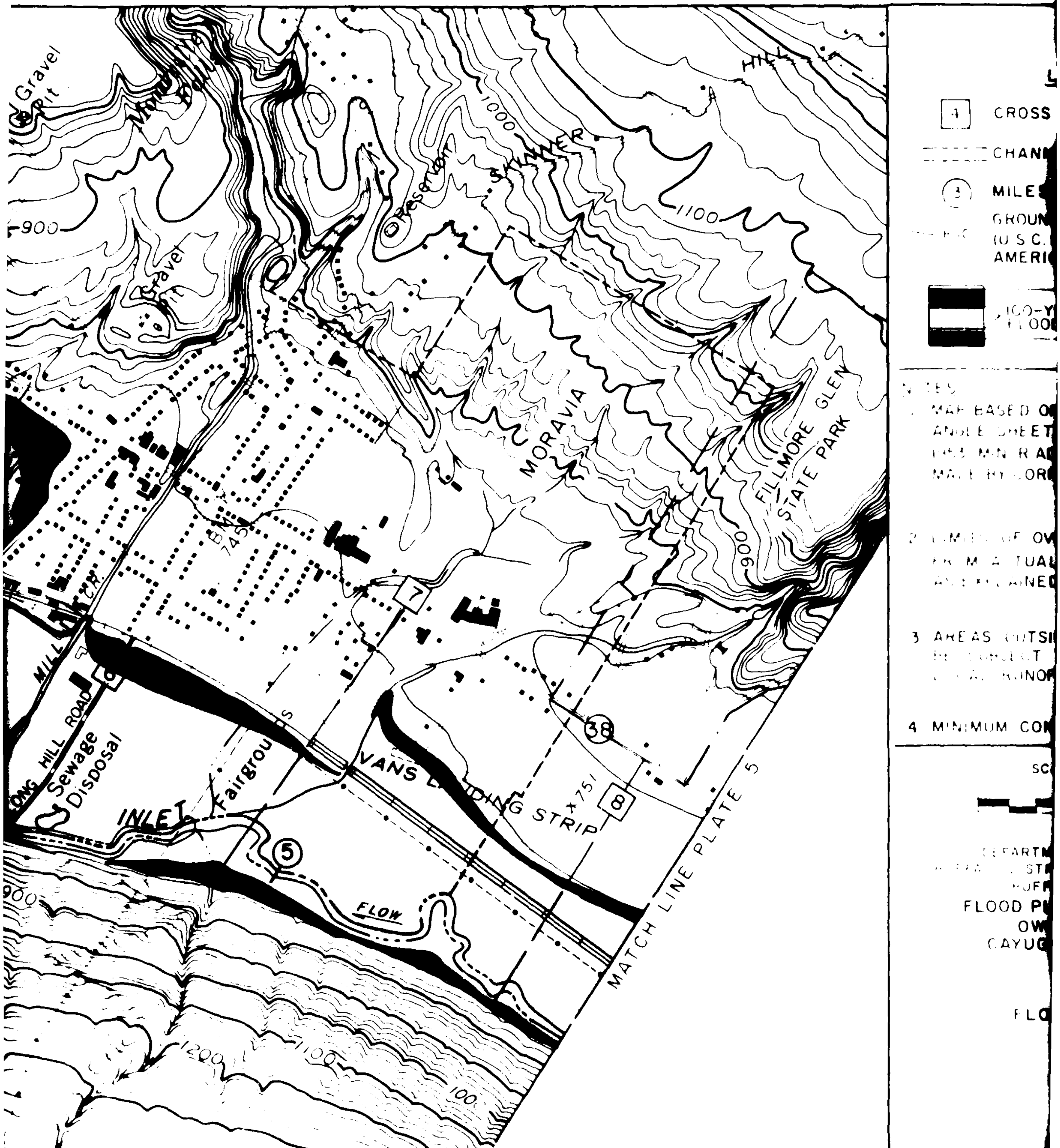

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4 CROSS SECTION

CHANNEL LIMITS

3 MILES ABOVE MOUTH

800 GROUND ELEVATION IN FEET (U S C & G S 1927 NORTH AMERICAN DATUM)

100-YEAR FLOOD

500-YEAR FLOOD

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SCALE IN FEET

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FLOOD PLAIN INFORMATION
OWASCO INLET
CAYUGA COUNTY, N. Y.

FLOODED AREAS

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PLATE 4

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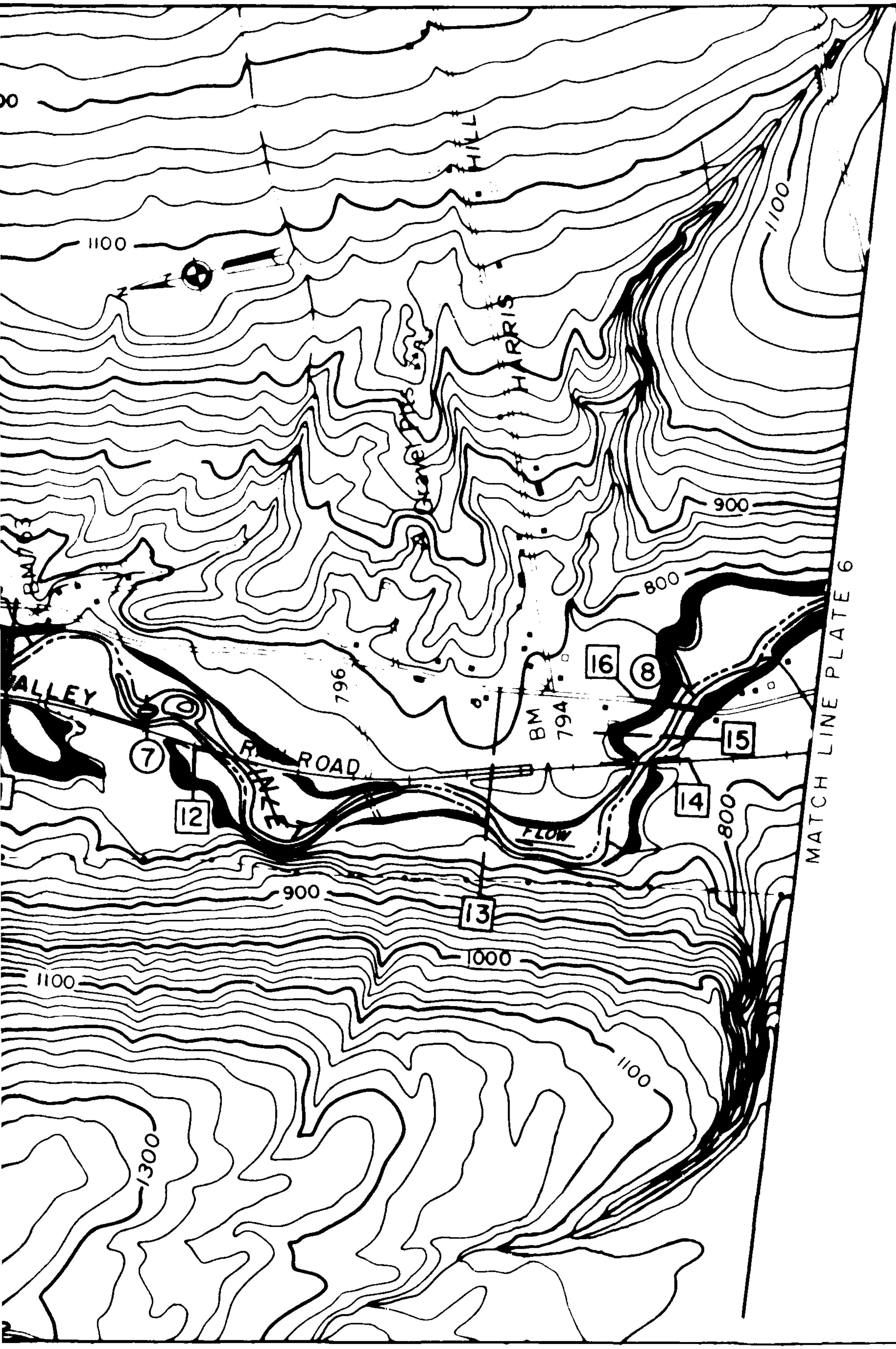

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CHANNEL LIMITS

3 MILES ABOVE MOUTH

GROUND ELEVATION IN FEET (U S C & G S 1927 NORTH AMERICAN DATUM.)

100-YEAR FLOOD

500-YEAR FLOOD

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SCALE IN FEET

0' 1000' 2000'

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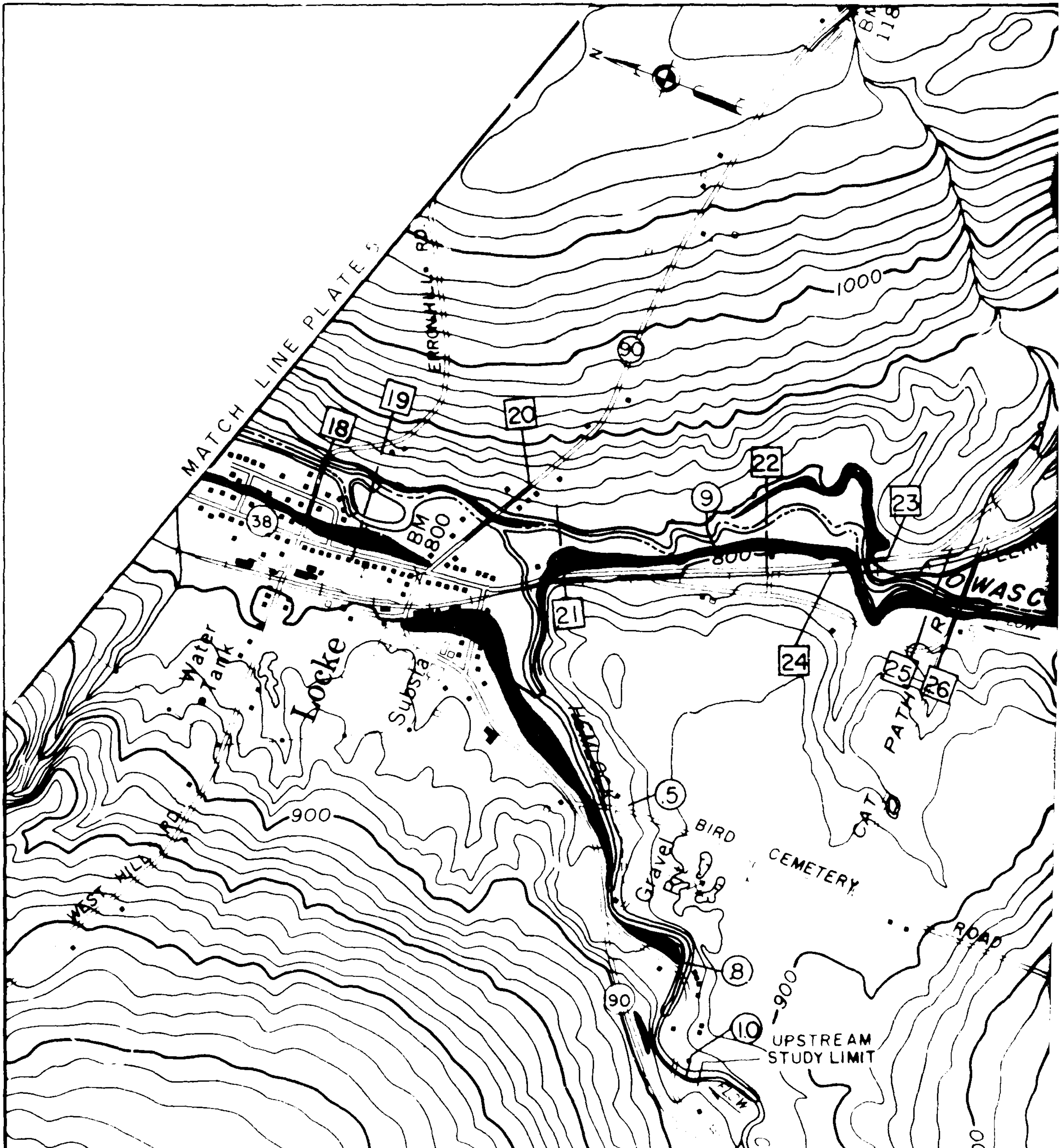
OWASCO INLET
CAYUGA COUNTY, N. Y.

FLOODED AREAS

JULY 1976


MATCH LINE PLATE 5
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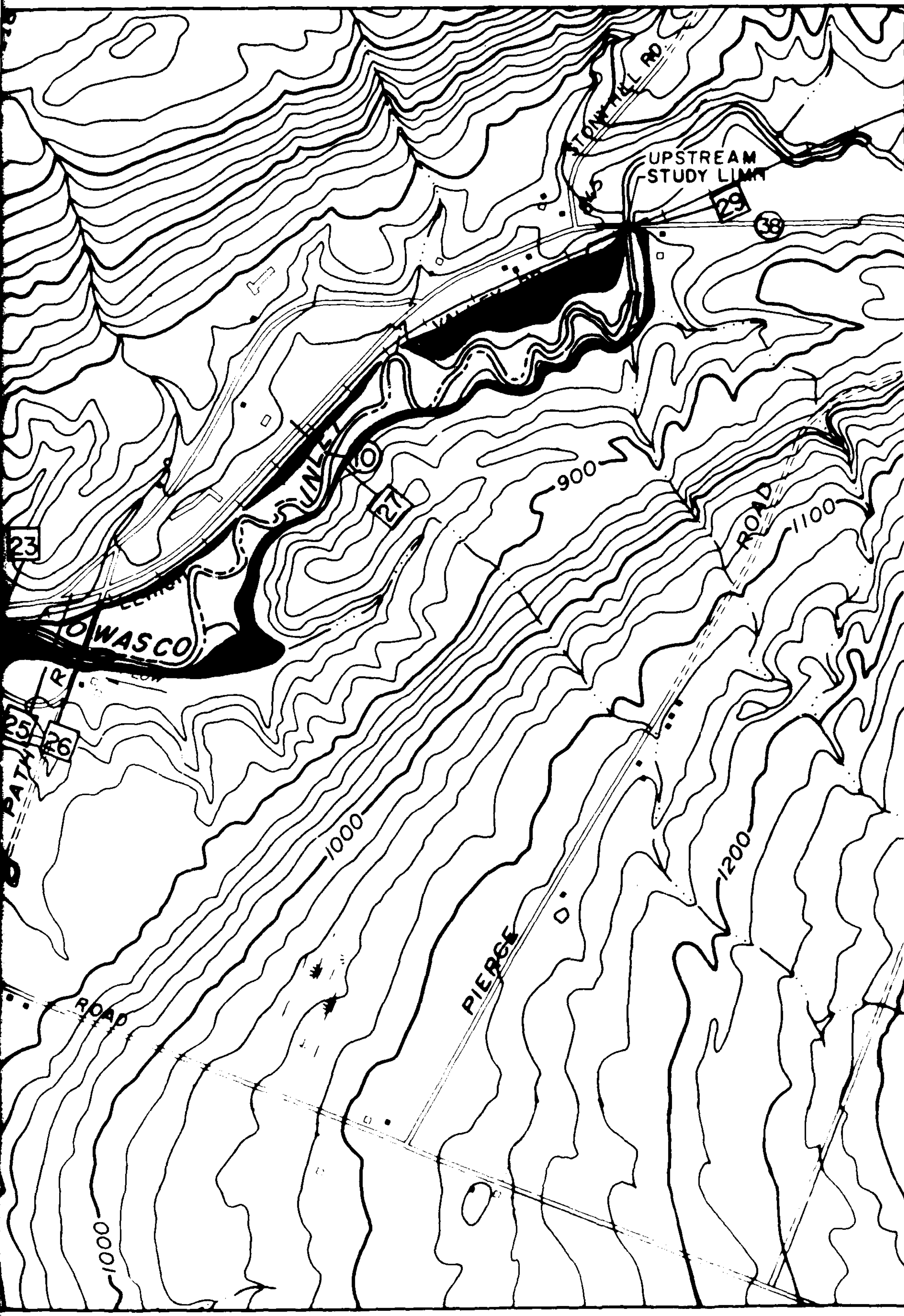
Locke
Water Tank
Subst'a
Gravel Pit
BIRD CEMETERY ROAD
CAT PATH RD
WEST HILL RD
UPSTREAM STUDY LIMIT
CREEK
OWASC
N



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100-YEAR FLOOD

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4 CROSS SECTION

CHANNEL LIMITS

3 MILES ABOVE MOUTH

800 GROUND ELEVATION IN FEET (U.S.C. & G.S. 1927 NORTH AMERICAN DATUM.)

100-YEAR FLOOD

500-YEAR FLOOD

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SCALE IN FEET

0' 1000' 2000'

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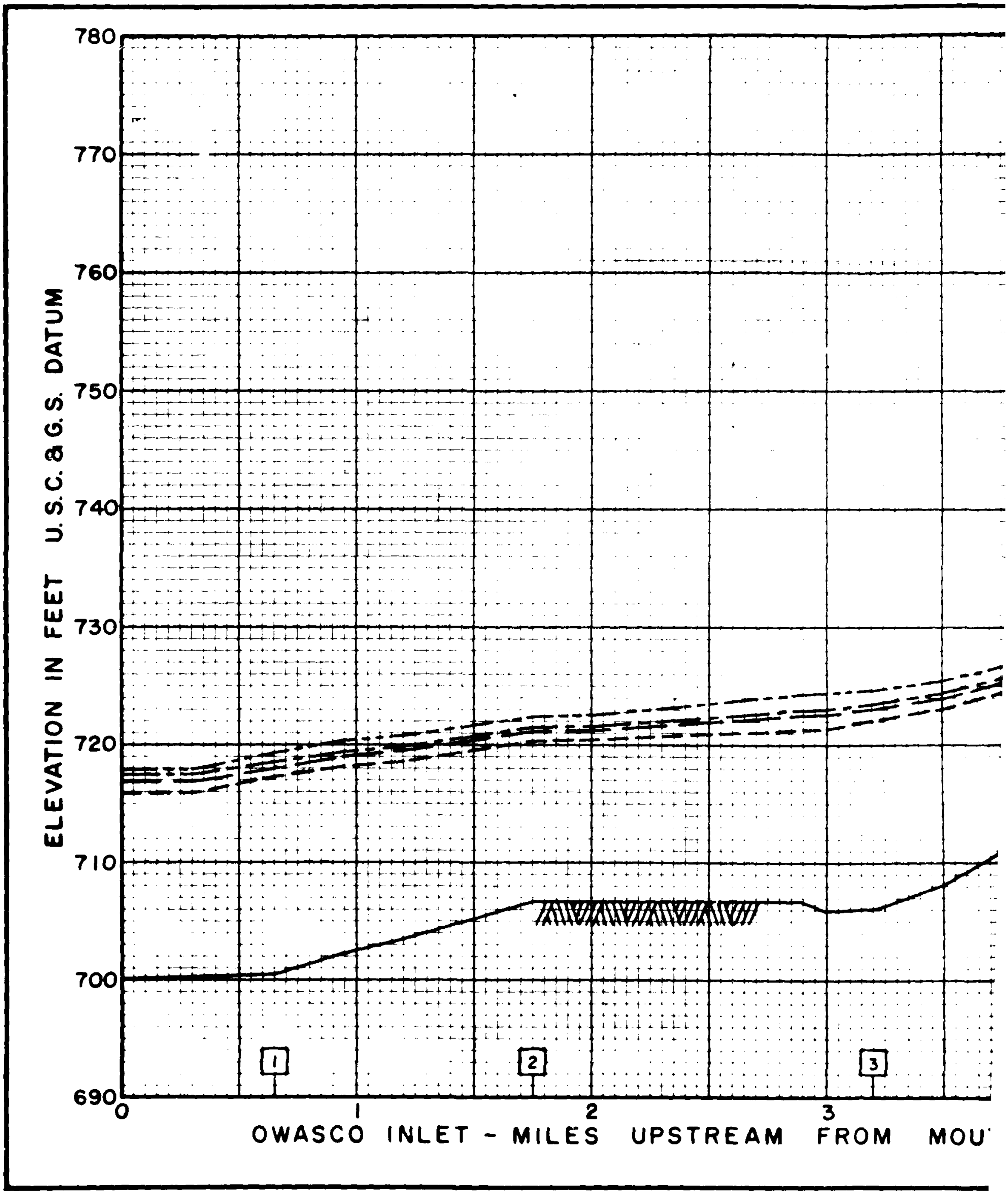
OWASCO INLET AND HEMLOCK CREEK
CAYUGA COUNTY, N. Y.

FLOODED AREAS

JULY 1976



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760
750
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730
720
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ELEVATION IN FEET U.S.C. & G.S. DATUM
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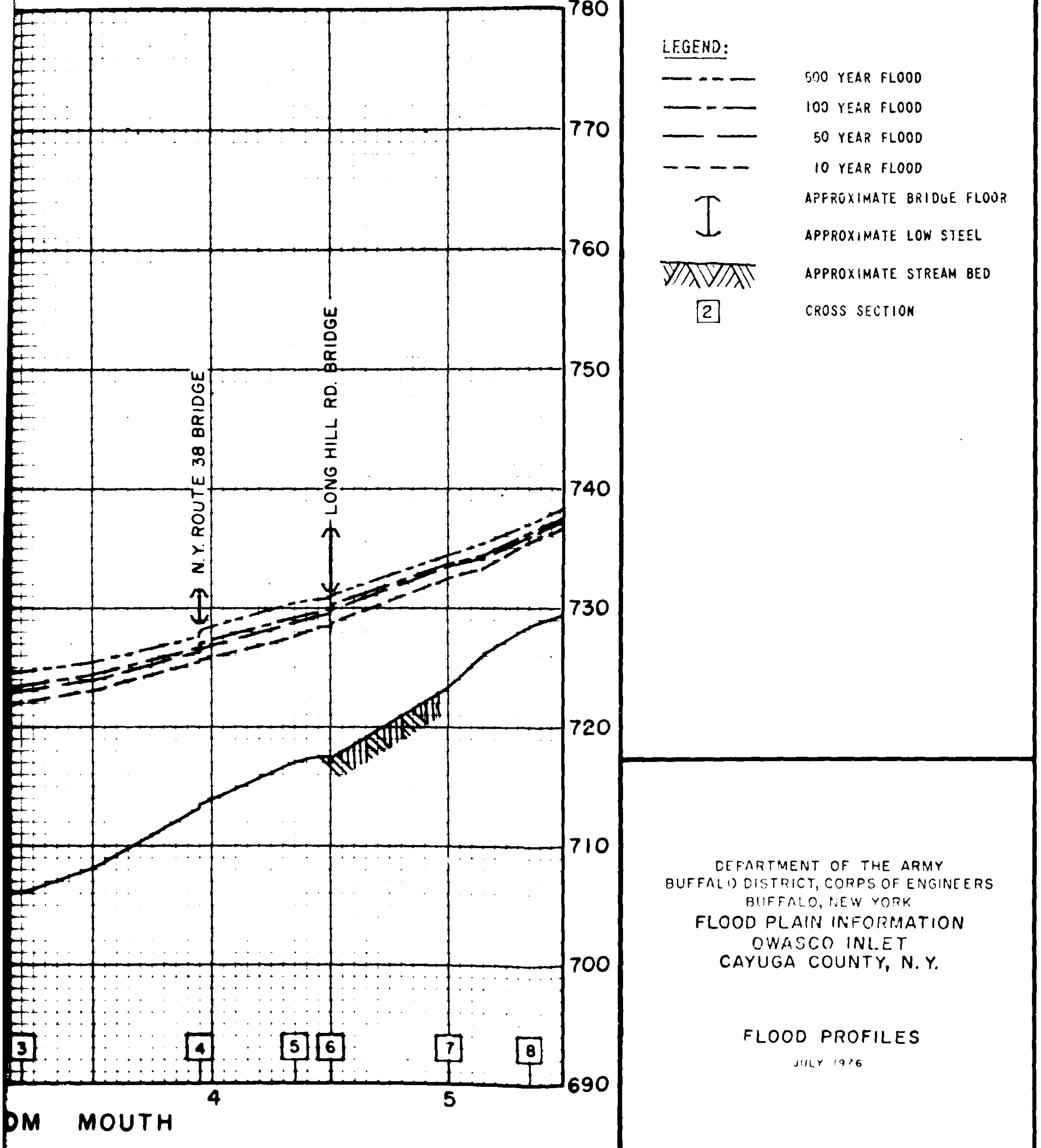
OWASCO INLET - MILES UPSTREAM FROM MOU



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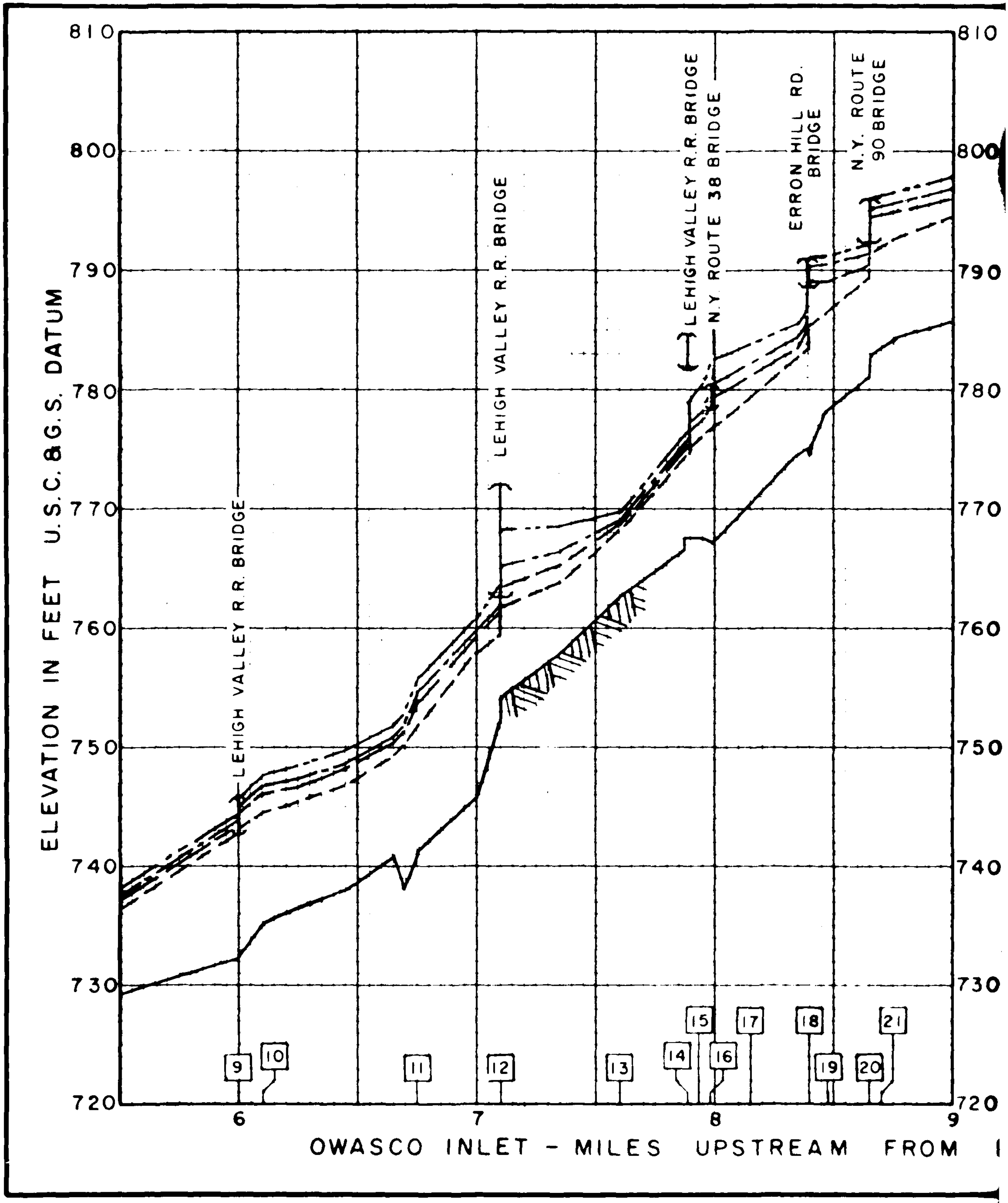
FLOOD PROFILES

JULY 1976



ELEVATION IN FEET U.S.C.&G.S. DATUM
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LEHIGH VALLEY R.R. BRIDGE
LEHIGH VALLEY R.R. BRIDGE
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ERRON HILL RD. BRIDGE
N.Y. ROUTE 90 BRIDGE
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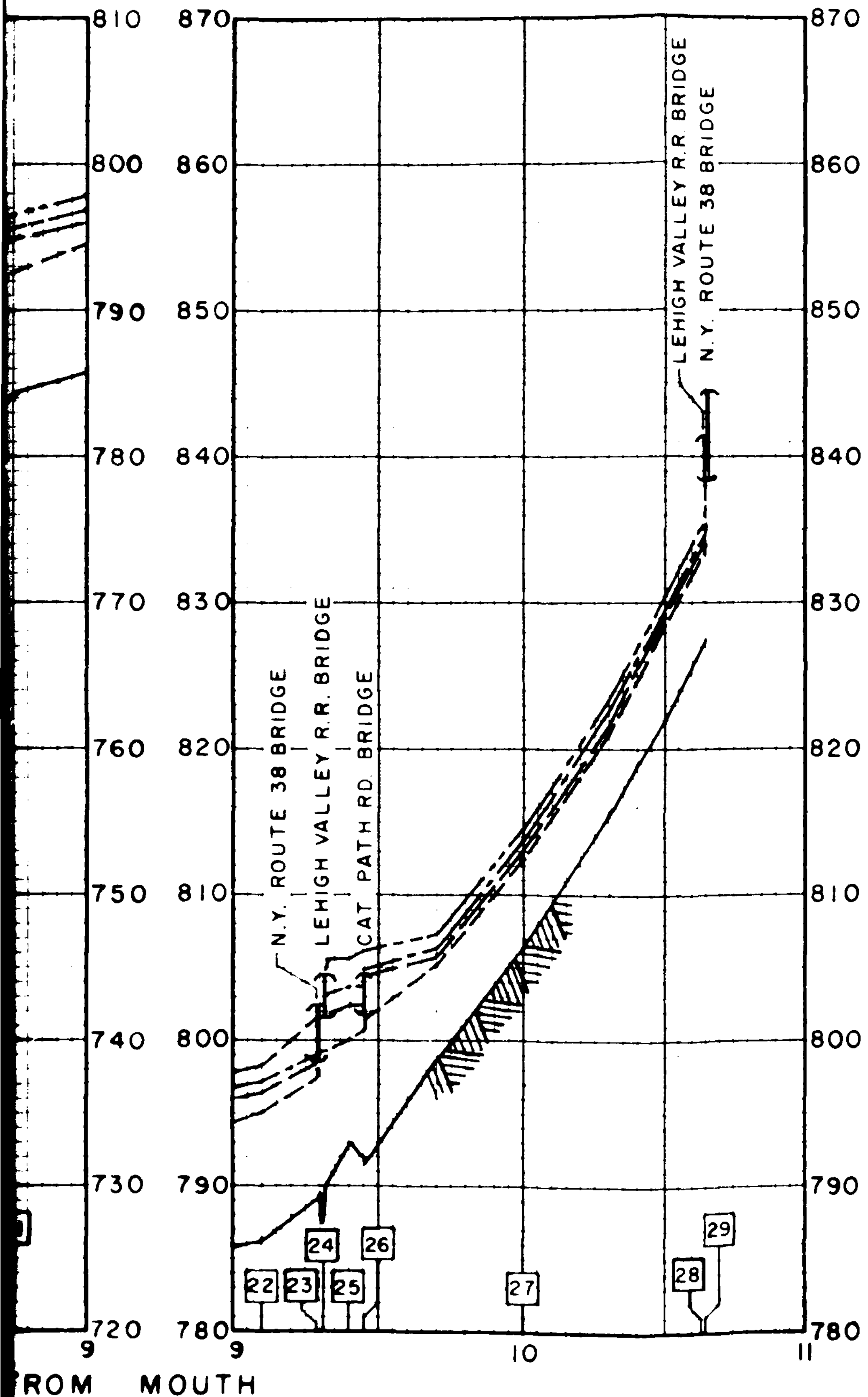
OWASCO INLET - MILES UPSTREAM FROM



LEGEND:

500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
APPROXIMATE BRIDGE FLOO
APPROXIMATE LOW STEEL
APPROXIMATE STREAM BED
2 CROSS SECTION

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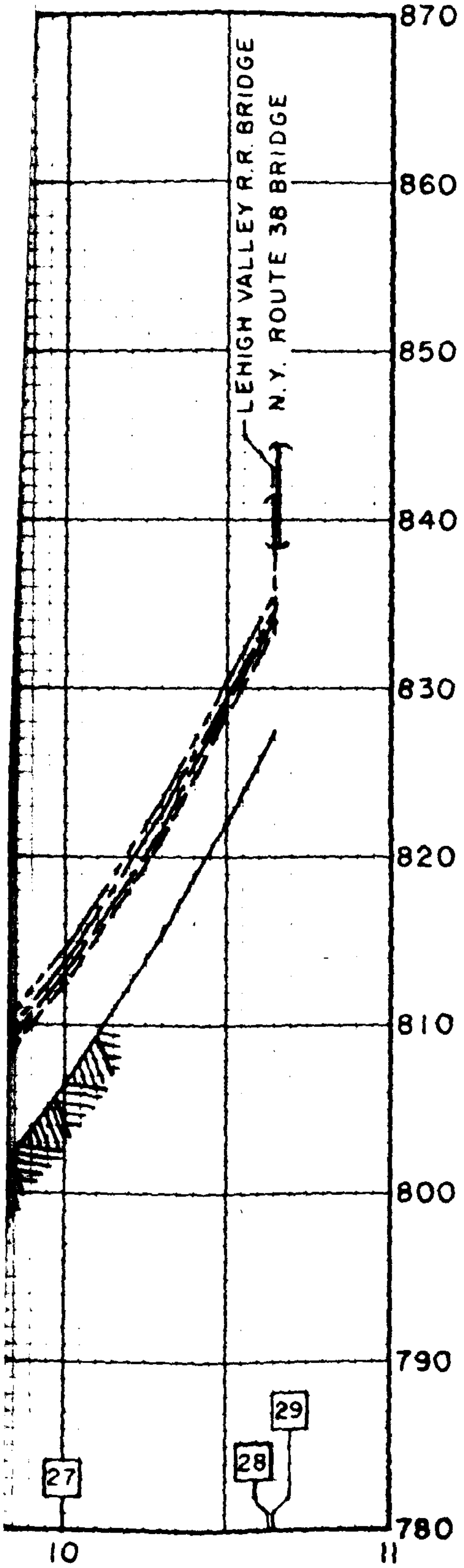

LEGEND:

500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
APPROXIMATE BRIDGE FLOOR
APPROXIMATE LOW STEEL
APPROXIMATE STREAM BED
2 CROSS SECTION

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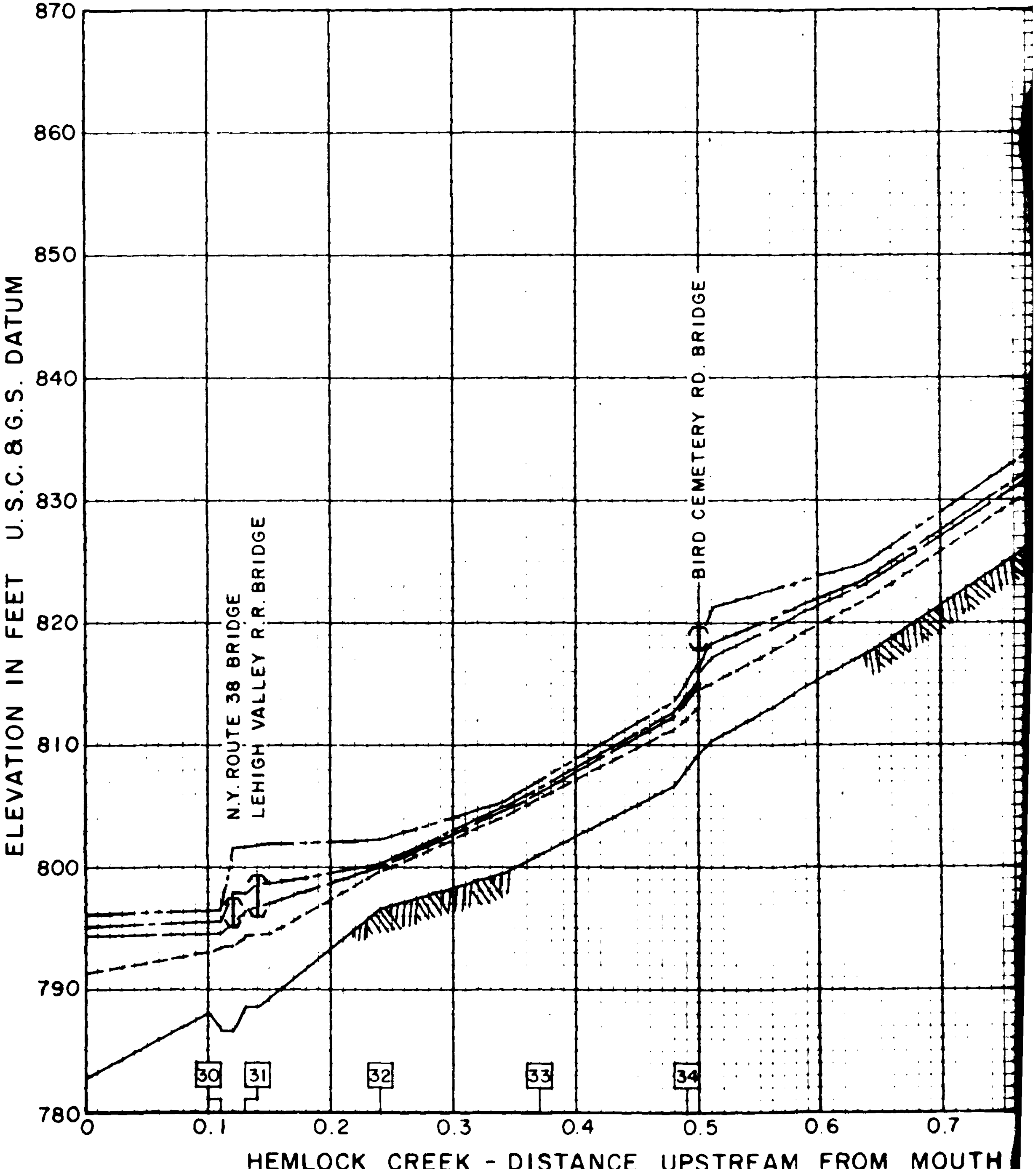

ELEVATION IN FEET U.S.C.&G.S. DATUM
870
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850
840
830
820
810
800
790
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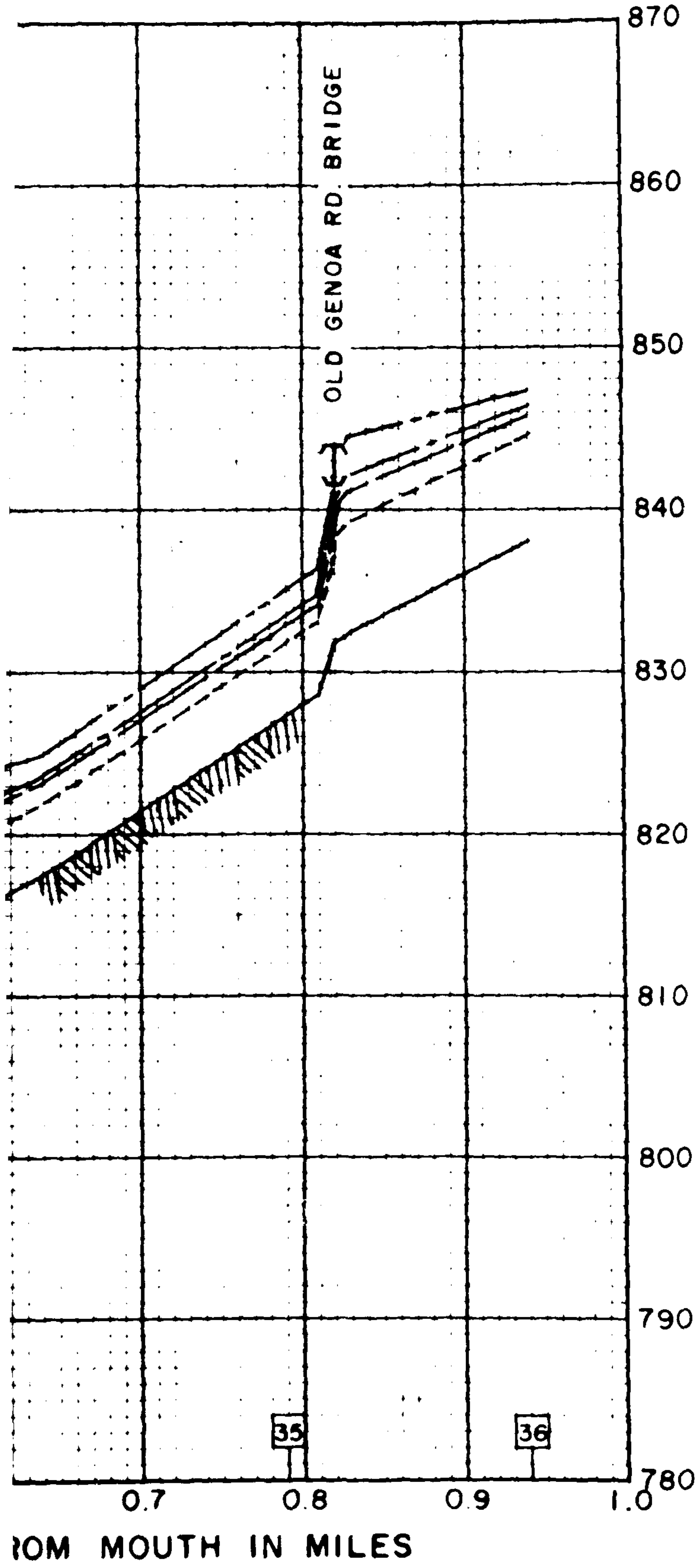
0.4
0.5
0.6
0.7
HEMLOCK CREEK - DISTANCE UPSTREAM FROM MOUTH
N.Y. ROUTE 38 BRIDGE
LEHIGH VALLEY R.R. BRIDGE
BIRD CEMETERY RD. BRIDGE
30
31
32
33
34



LEGEND:

500 YEAR FLOOD

100 YEAR FLOOD

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10 YEAR FLOOD

APPROXIMATE BRIDGE FLOOR

APPROXIMATE LOW STEEL

APPROXIMATE STREAM BED

2 CROSS SECTION

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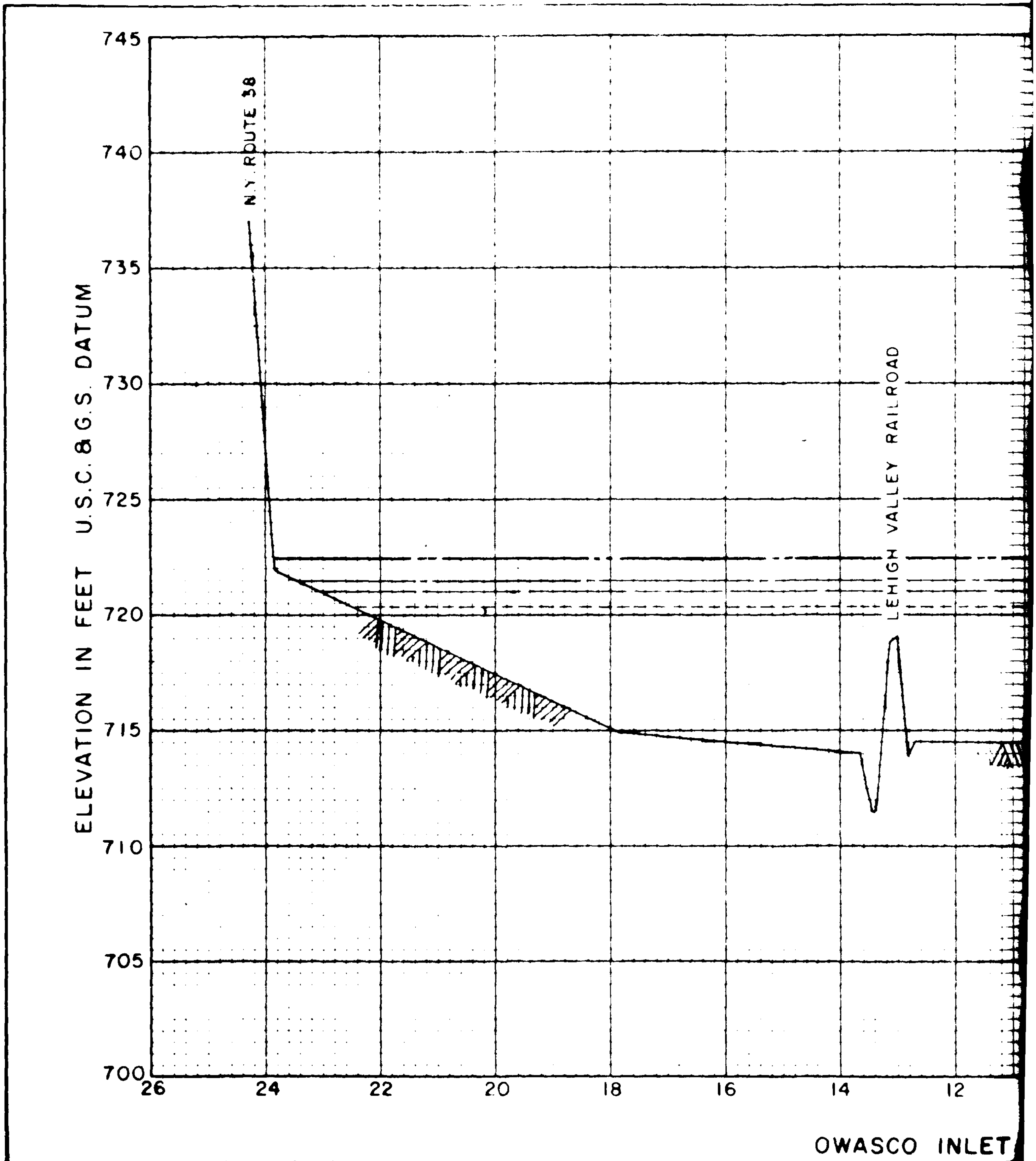
FLOOD PLAIN INFORMATION
OWASCO INLET AND HEMLOCK CREEK
CAYUGA COUNTY, N.Y.

FLOOD PROFILES

JULY 1976

PLATE 9



ELEVATION IN FEET U.S.C.&G.S. DATUM
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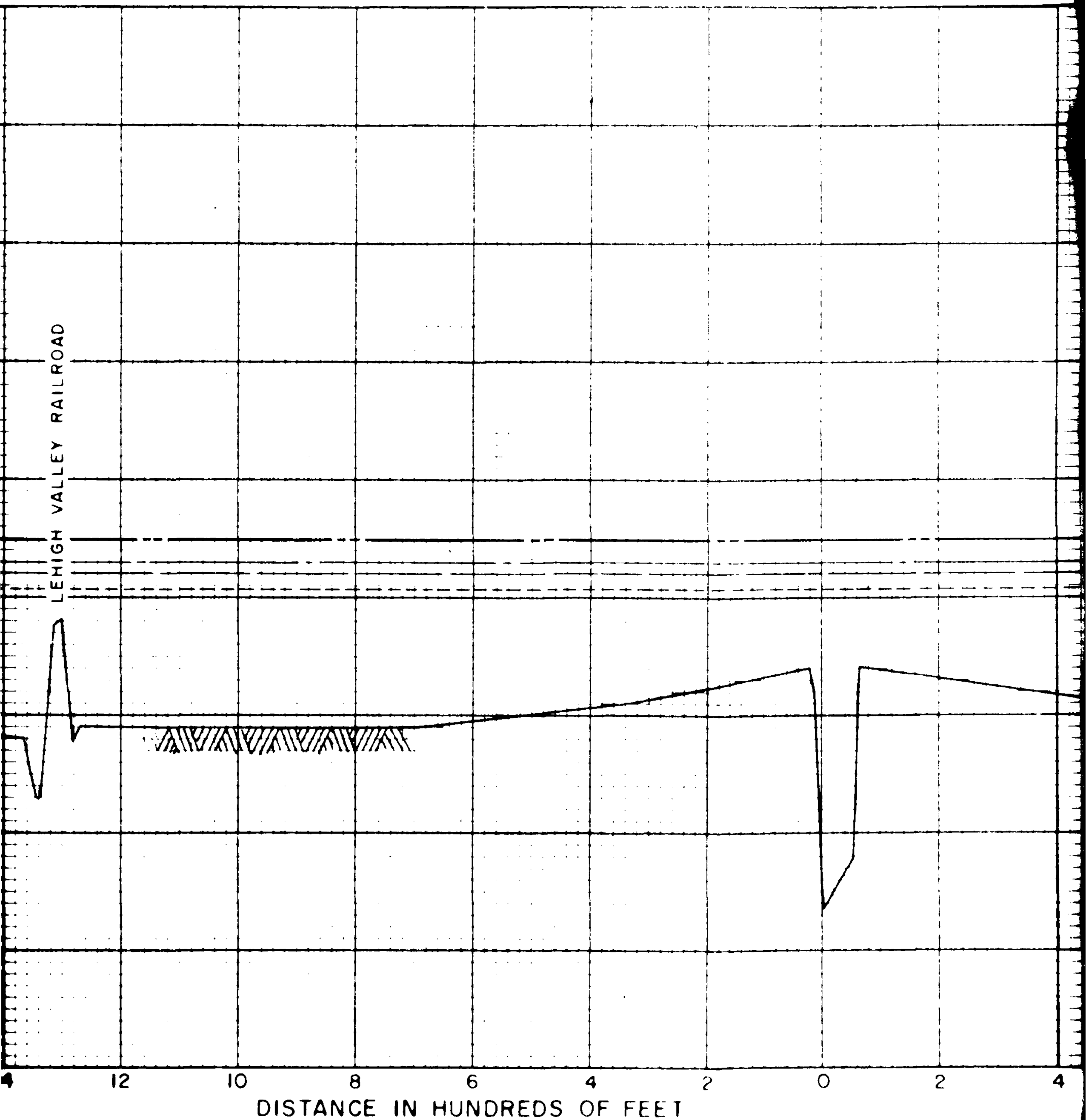
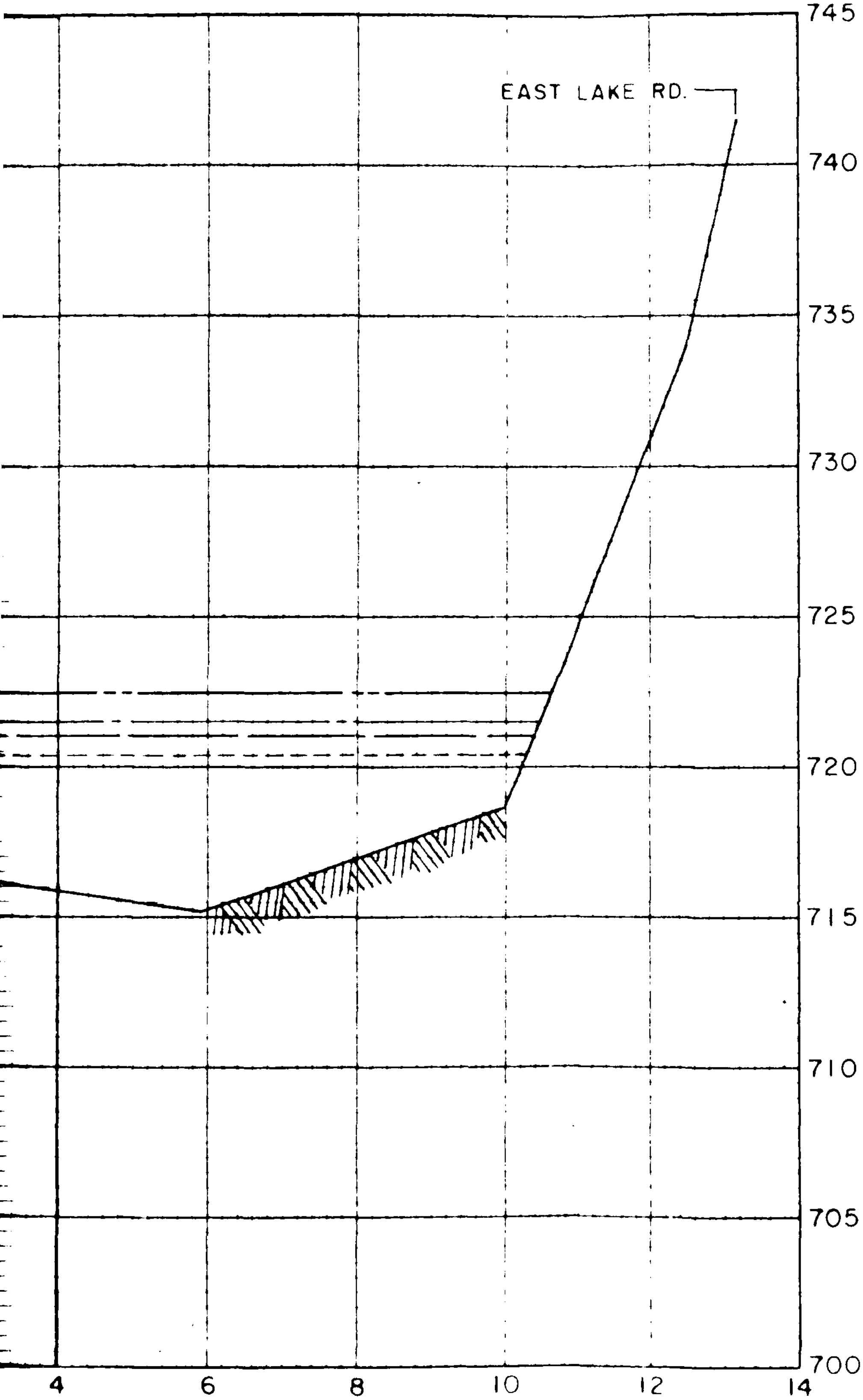
N.Y. ROUTE 38
LEHIGH VALLEY RAILROAD
OWASCO INLET



WASCO INLET CROSS SECTION NO. 2 MILE POINT 1.75



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BUFFALO, NEW [illegible]

FLOOD PLAIN INFORMATIO[illegible]
OWASCO INLET
CAYUGA COUNTY, N.Y.

VALLEY CROSS SECTION

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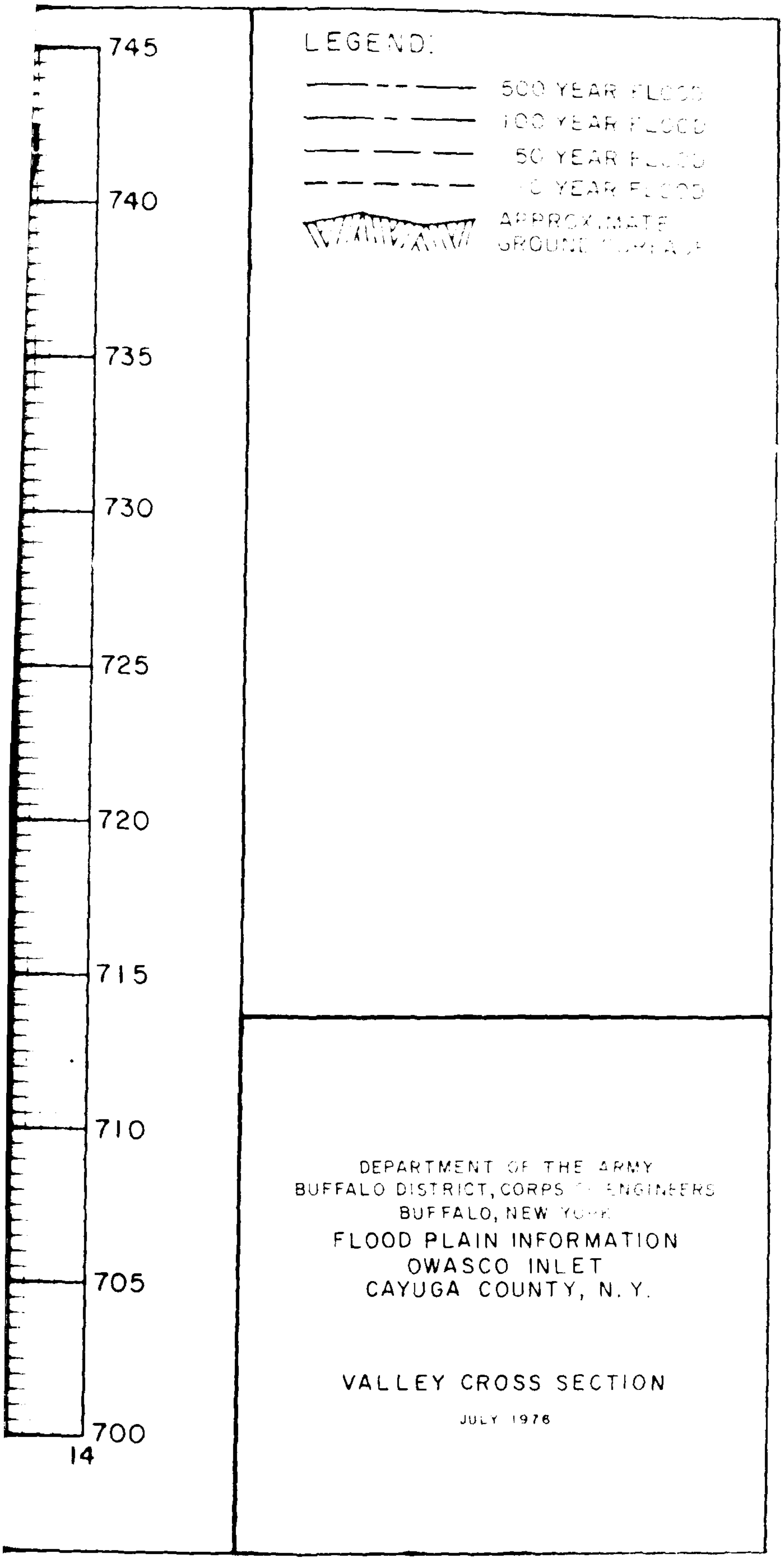

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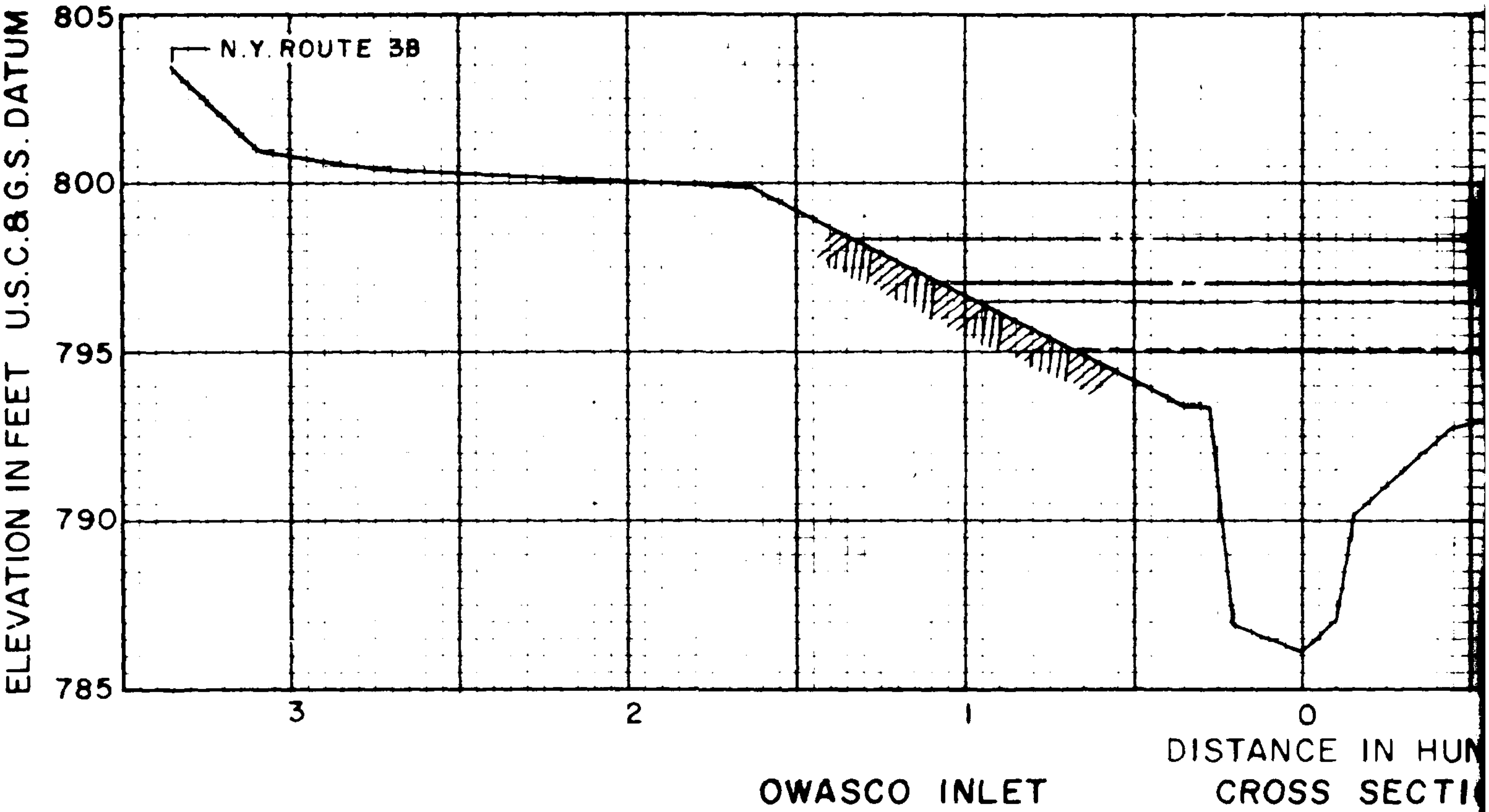
BUFFALO DISTRICT, CORPS OF ENGINEERS
BUFFALO, NEW YORK

FLOOD PLAIN INFORMATION
OWASCO INLET
CAYUGA COUNTY, N. Y.

VALLEY CROSS SECTION

JULY 1976

PLATE 10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ELEVATION IN FEET U.S.C.&G.S. DATUM
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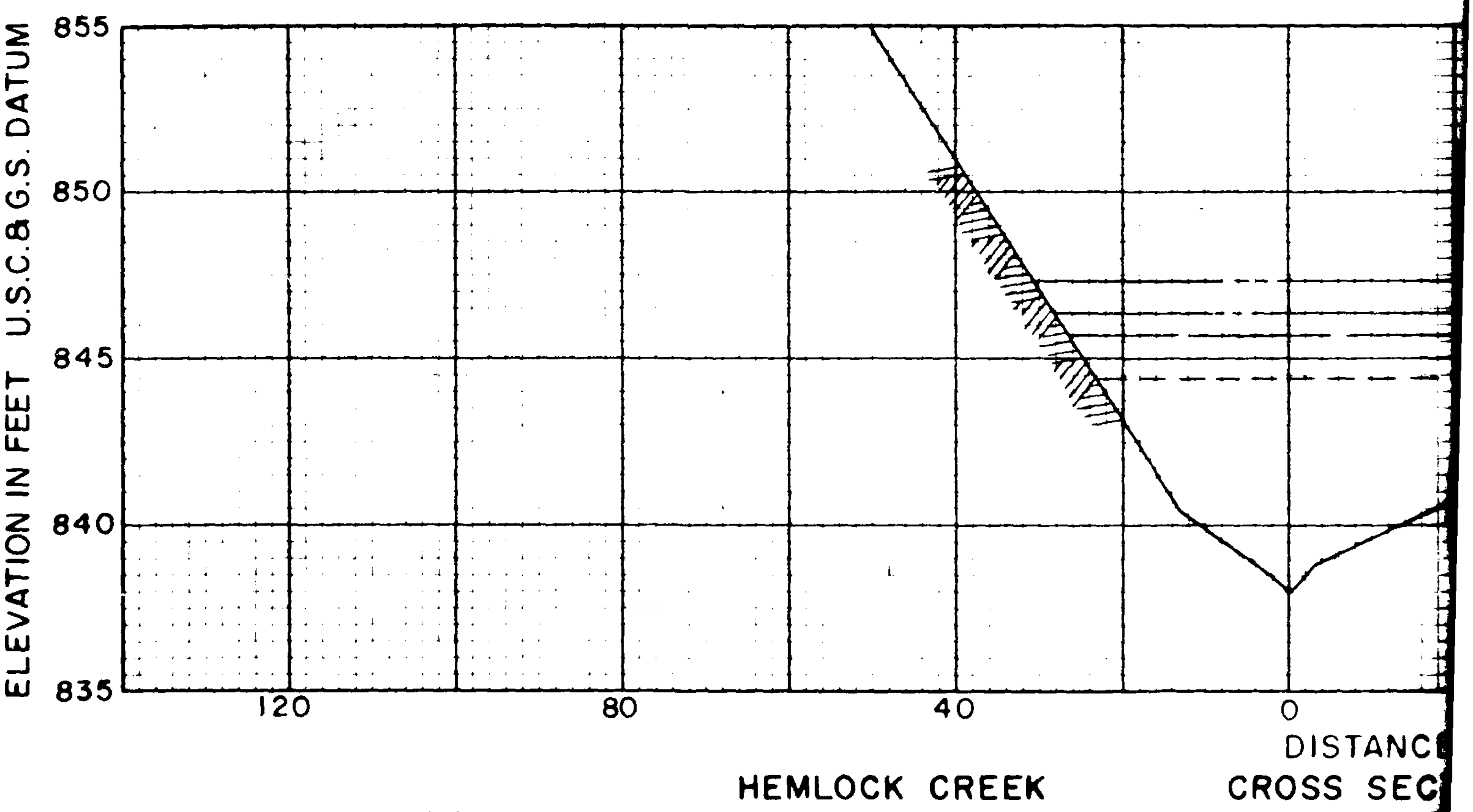
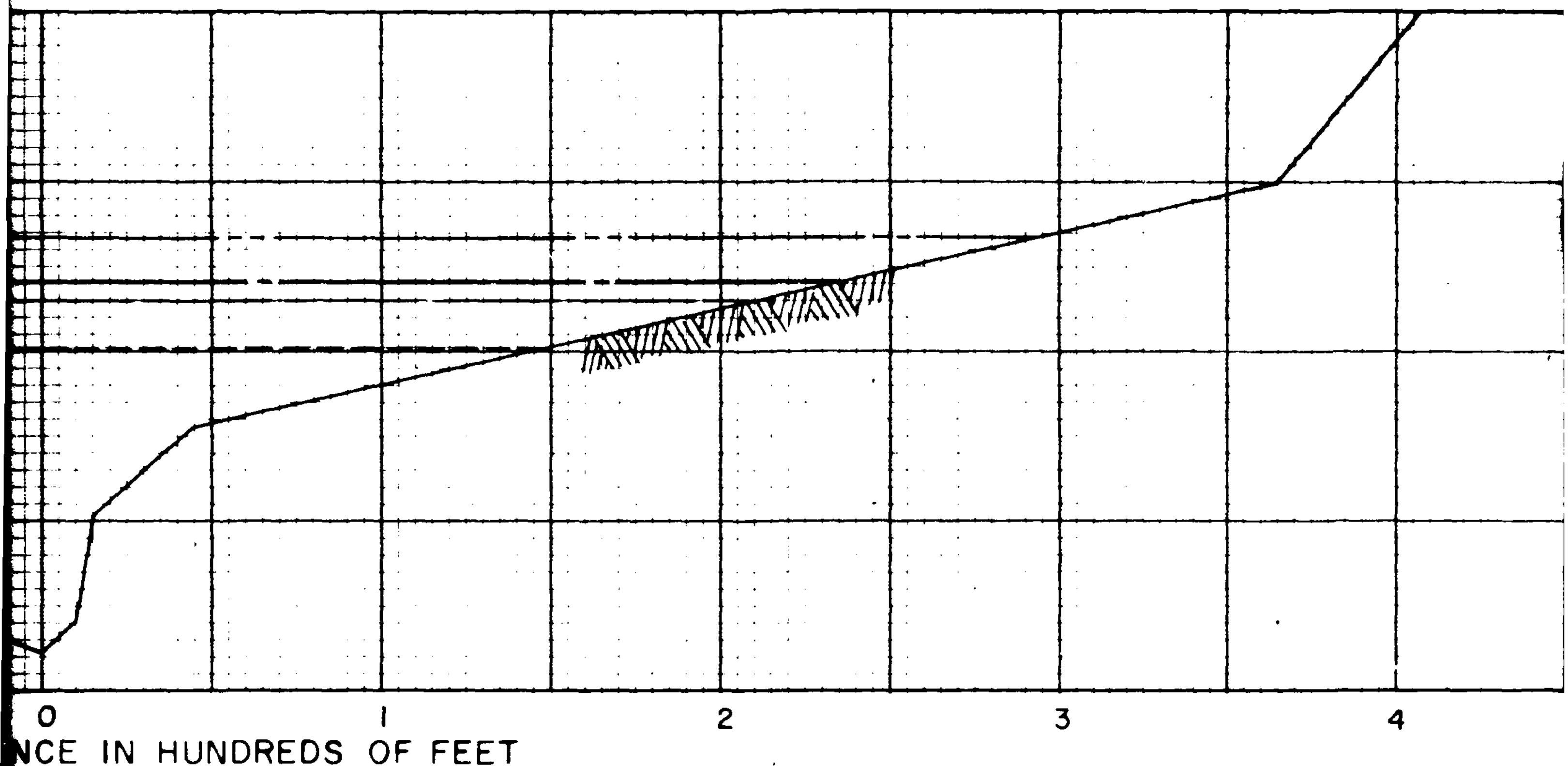
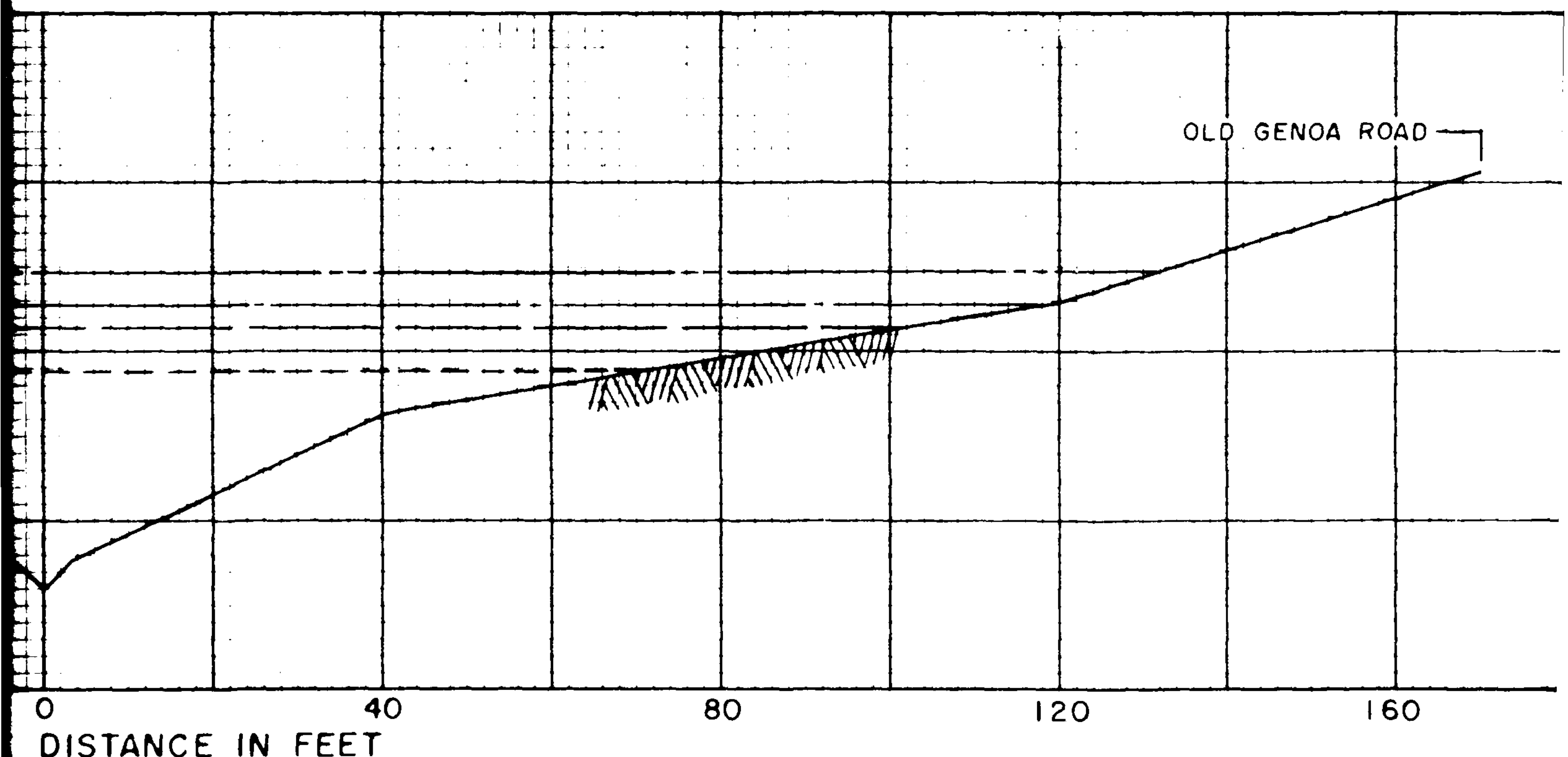
OWASCO INLET
CROSS SECTI

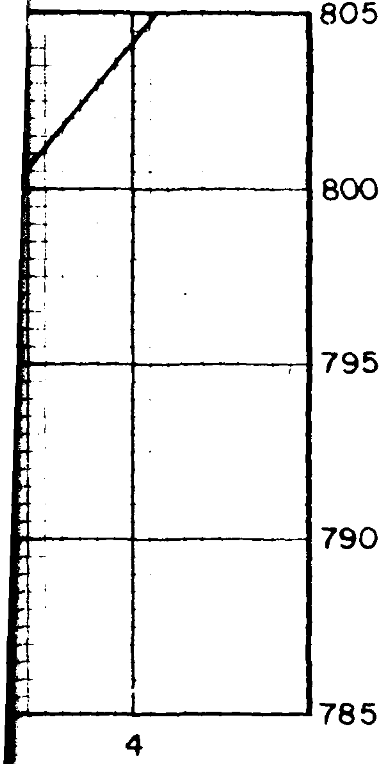

855
850
845
840
835
ELEVATION IN FEET U.S.C.&G.S. DATUM
120
80
40
0
DISTANC
HEMLOCK CREEK
CROSS SEC

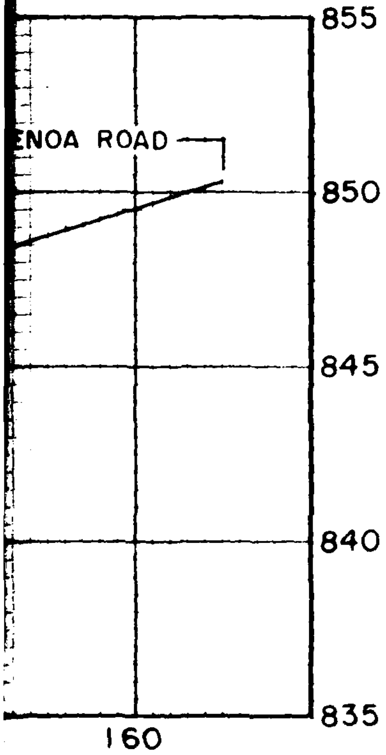


OSS SECTION NO.22 MILE POINT 9.10



ROSS SECTION NO.36 MILE POINT 0.94





LEGEND:

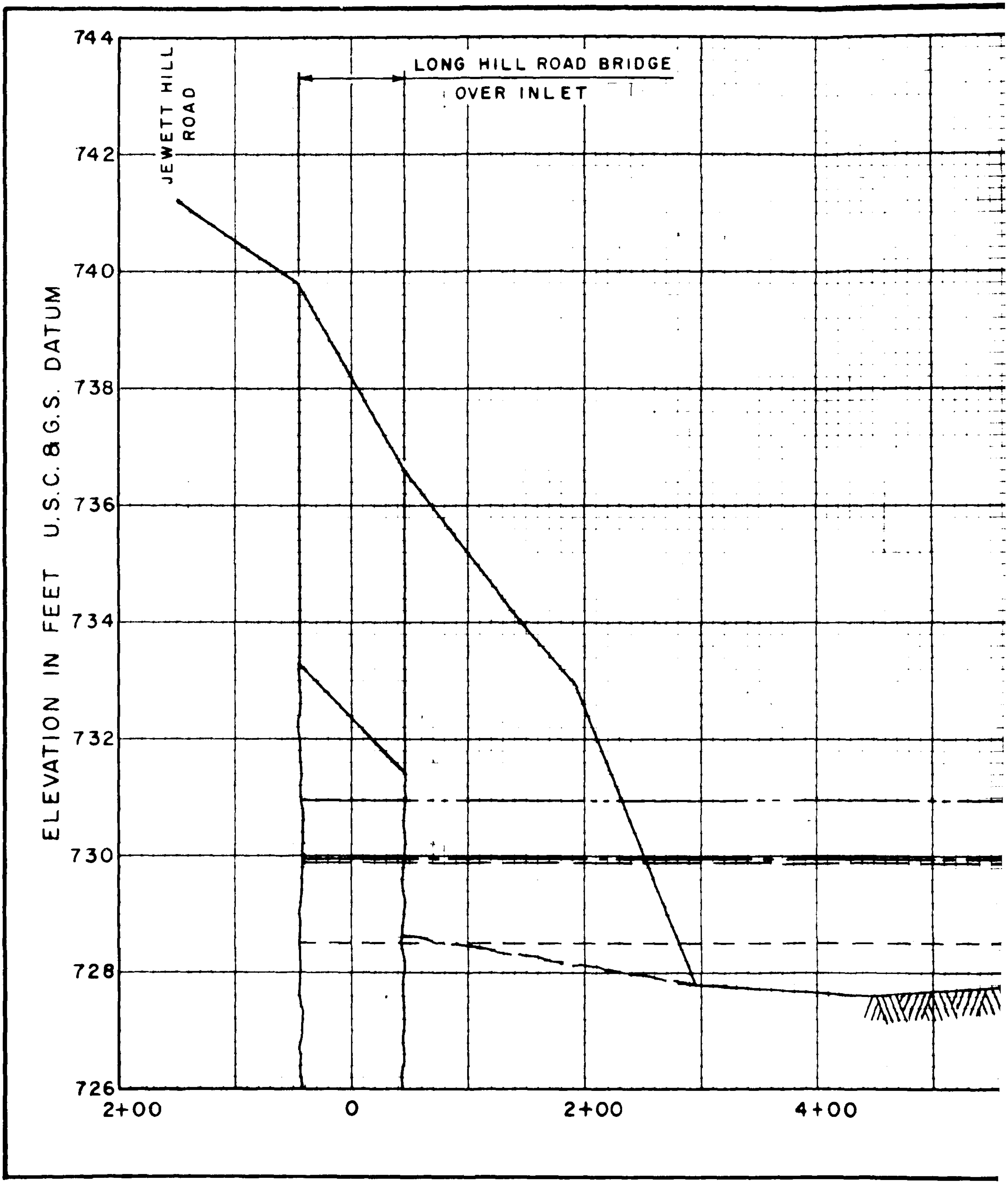
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
APPROXIMATE GROUND SURFACE

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
BUFFALO, NEW YORK

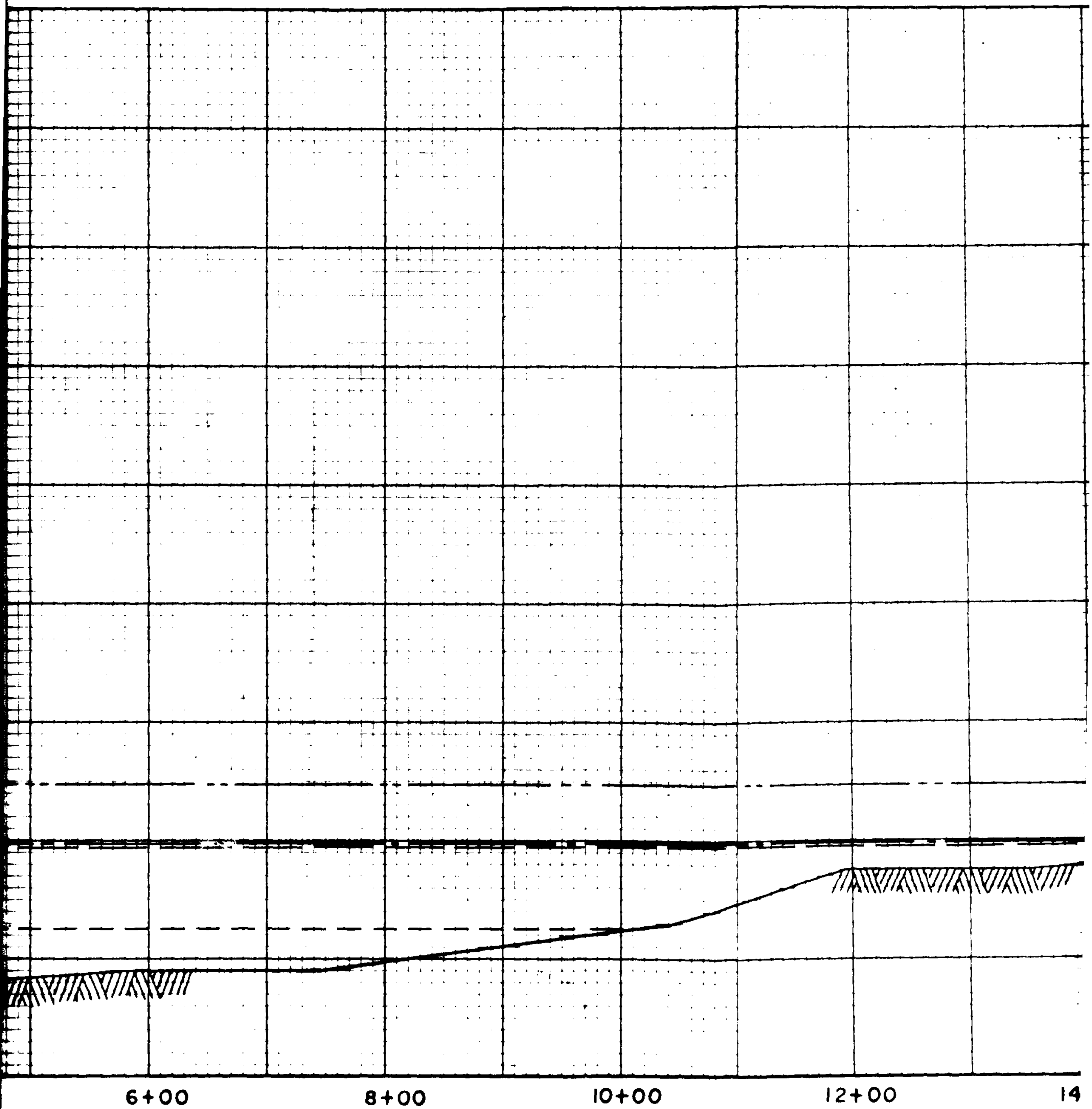
FLOOD PLAIN INFORMATION
OWASCO INLET
AND HEMLOCK CREEK
CAYUGA COUNTY, N. Y.

VALLEY CROSS SECTION

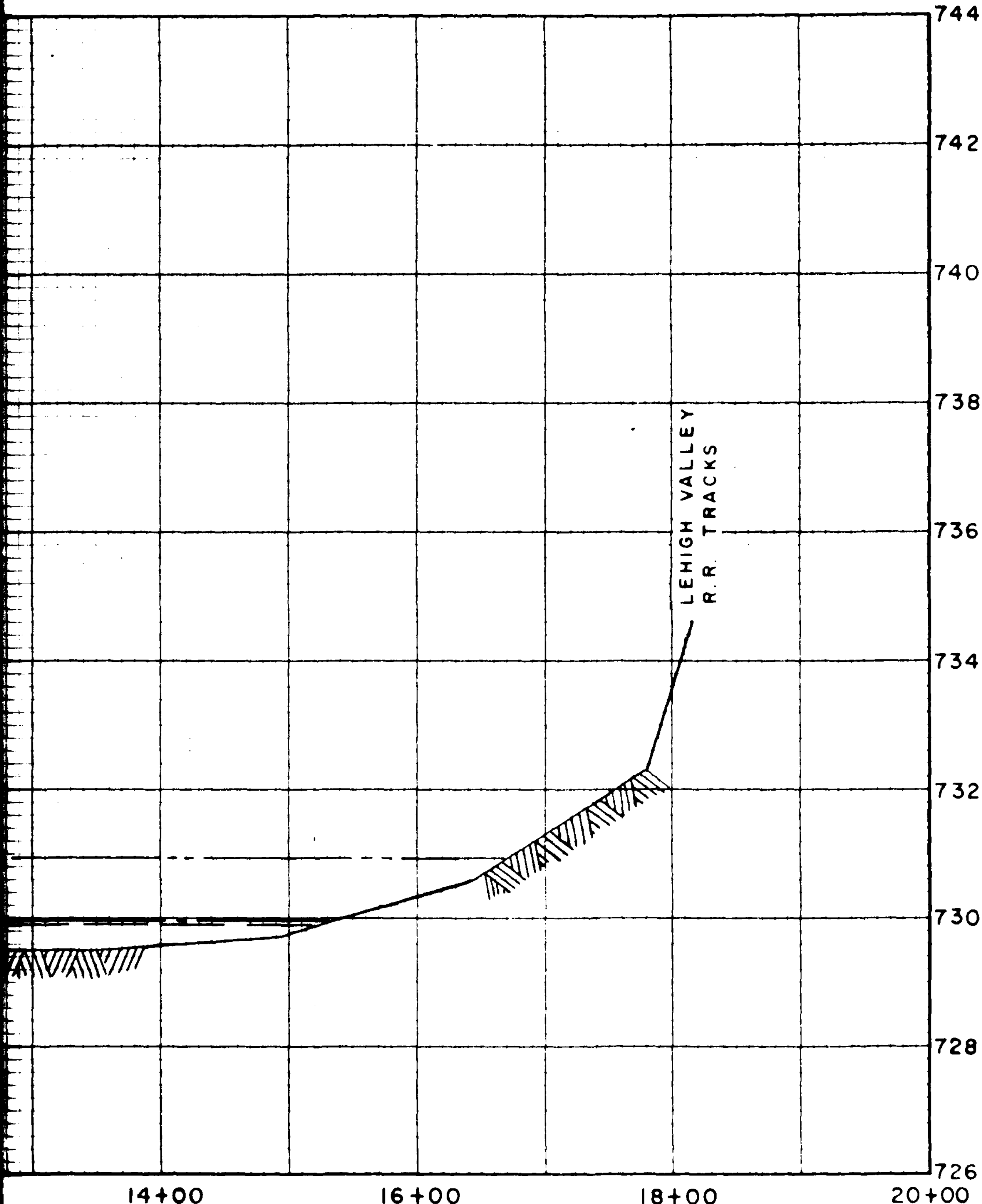
JULY 1976



LONG HILL ROAD BRIDGE
OVER INLET
JEWETT HILL ROAD
ELEVATION IN FEET U.S.C.&G.S. DATUM
744
742
740
738
736
734
732
730
728
726
2+00
0
2+00
4+00



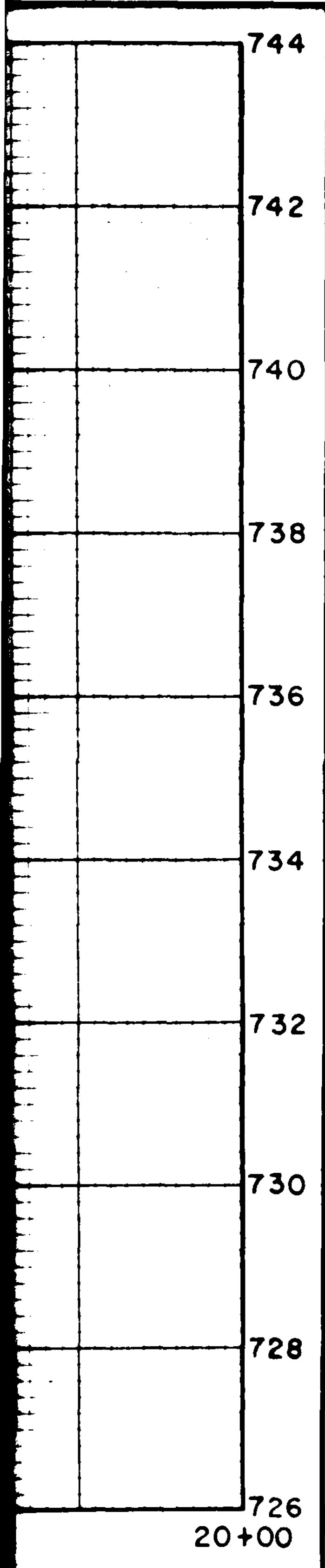
PROFILE OF LONG HILL ROAD OVER OWASCO INLET



LEGEND:

DEPARTME
BUFFALO DISTRIC
BUFFA
FLOOD PLA
OWAS
CAYUGA

VALLEY



LEGEND:

500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
APPROXIMATE GROUND SURFACE

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
BUFFALO, NEW YORK

FLOOD PLAIN INFORMATION
OWASCO INLET
CAYUGA COUNTY, N. Y.

VALLEY CROSS SECTION

JULY 1976

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